The Chemical Age

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Luminescence

A FASCINATING account of modern applications of luminescent substances was given to the Society of Chemical Industry recently by Dr. L. Levy and Mr. D. W. West; this is an important and growing development based on the transformation of radiation shorter than that of the visible spectrum into longer wavelengths that fall within that spectrum. Bioluminescence was known to Aristotle, and Pliny knew some of the luminescent minerals. About 1602 a shoemaker of Bologna, named Vincenzo Calcariolo, discovered phosphorescence in a fossil subsequently found to consist of an alkaline earth sulphide. Modern development in luminescence began with the use of barium platinocyanide screens for the detection of radioactivity and of X-rays. These screens were in general use up to 1910, but were very expensive and not too satisfactory. It was necessary, for medical purposes, to devise a screen that should give a bright fluorescence when excited, but that should be free from phosphorescence, i.e., the emanation of visible radiation should disappear immediately the source of excitation was removed. Zinc silicate was found to be an improvement on barium platinocyanide, but always had some after-glow and was affected only by soft radiation. Later, cadmium tungstate and zinc cadmium sulphide were found to be satisfactory and it was further discovered that phosphorescence could be completely suppressed by the addition of one part in 2,000,000 of nickel. The development of the intensifying screen has greatly shortened many medical and industrial operations, and the use for this purpose of zinc sulphide with the addition of the trifling quantity of nickel impurity was due to Dr. Levy himself.

There are many modern applications of luminescence which do not require the specific preparation of luminescent substances for the purpose. Fresh eggs appear red and stale eggs blue in ultra-violet rays; deletions in documents can be detected, thus assisting in discovering forgeries; the study of medieval documents revealing the existence of prior writing beneath the surface has added to historical knowledge; X-rays have been found to be of great service in the examination of old paintings as those who were present at an interesting lecture before the S.C.I. a few years ago will remember. These "by-products" of luminescence were not described in the present lecture which was wholly concerned with applications in which luminescent substances are used for the express purpose of intensifying light for various reasons.

As might be expected, the luminescence industry—for so it may now be termed—is closely welded to the electrical industry. So far as is known, luminescence is not likely to find applications in the other major lighting industry, the gas industry, because gas lighting does not produce ultra-violet radiation, not being sufficiently high in temperature. Modern studies of luminescence, therefore, will probably result in the complete disappearance of gas lighting except for certain specific purposes, particularly if luminescent substances can be discovered that will give a true day-light effect. For the time being the major developments outside the medical field appear to be in the direction of magnificent colour effects for use in advertising or in the theatre. The lecturers gave some impressive demonstrations of the wonderful colour effects which may be obtained by painting scenery and pictures with a mixture of ordinary paints and luminescent materials, and lighting first by ordinary light and then by ultra-violet. There are now being developed intensely brilliant effects, which are being utilised in electric signs, by the utilisation of a thin layer of luminescent material deposited on the inner surface or within the glass of high-voltage gas discharge tubes. If mercury tubes are used the efficiency diminishes slowly in use, but if neon tubes are used the efficiency does not diminish. Apparently, only neon and mercury will serve as the exciting radiation for these tubes. It has been predicted that this method will outstrip all artificial sources of light because the transformation of the energy ultra-violet radiation into visible light is practically 100 per cent.

There are pure substances that are luminescent, but in general, commercial applications are based on the elimination of even the smallest trace of substances, such as iron, which suppress luminescence, and the introduction of minute quantities of other substances, such as nickel, copper or silver which promote luminescence. The phenomenon appears to be caused by the transference, within the crystal, of electrons from a lower to a higher energy level during excitation, their return to the lower level causing fluorescence (if instantaneous) or phosphorescence (if delayed). The introduction of the impurity alters the position of the energy levels in crystals.

For some reason the lay mind associates dyes with poisons and dyed garments with dermatitis. In fact, many dyestuffs are antiseptic and if dyed materials cause skin diseases no one would be immune from them. Fortunately, great strides have been made in the investigation of these cases. . . . But until the judiciary of this country can be convinced of this, the dyer is always menaced by the possibility of a claim arising from dermatitis.

—*W. M. Brown.*

NOTES AND COMMENTS

Success of the Land Fertility Scheme

POSITIVE proof of the success of the land fertility scheme, which provides lime and basic slag subsidies, was afforded by the granting of a supplementary sum of £156,000 to the Land Fertility Committee in the House of Commons last week. The Minister of Agriculture pointed out that the supplementary estimate was necessary because the land fertility scheme had been successful beyond expectations. It was estimated that the total quantity of lime used on the land had been four times as much as that in the corresponding period before the scheme was put into operation, and that there had been an increase of 70 per cent. in the quantity of basic slag used. The estimate drawn up a year ago would fall short of the amount of lime to be supplied by about 615,000 tons and would exceed the amount of basic slag by about 100,000 tons. The Minister mainly attributed this decrease in quantity of basic slag to the fact that supplies were not available owing to the falling off in the output of steel. Now that the scheme has proved so successful as to warrant an increase in the financial resources behind the lime and basic slag subsidies it is reasonable to expect that any further extensions of the scheme should embrace other classes of fertiliser products and thus correct any tendency towards unfair discrimination.

Further Encouraging Signs

IT will not be the Chancellor of the Exchequer's fault if business does not improve in the next few months. He gave a broad hint last week that there would be no serious addition to the burdens of taxation in his forthcoming Budget. He followed that up this week by telling the House of Commons that there were most distinct indications of recovery. Although, he said, the year 1938 was not a year of marked depression, it was certainly not a year of very great and exceptional prosperity. If present indications continue, he thought it likely that the Budget a year hence would reflect more prosperous conditions than could be expected in this year's Budget. These admittedly were general reflections, but the Treasury is a very cautious body and its estimates of the trend of profits rarely go far astray. With this encouragement, business men are amply justified in showing more confidence than they have felt in the last few months.

A Symposium on Gas Purification

FOUR papers concerned with the purification of gas from sulphur compounds and tar were presented at a joint meeting of the Chemical Engineering Group of the Society of Chemical Industry, with the Institution of Chemical Engineers and other societies at Manchester yesterday (Friday). The removal of organic sulphur compounds by washing with solvent oil was described by Mr. Charles Cooper; carbon disulphide and thiophenes are the most important compounds to be considered as of the two other compounds likely to be encountered, namely mercaptans and carbon oxysulphide, the former is only present in small quantities and the latter being a gas, cannot be completely extracted by an economic oil-washing process. Mr. H. F. Taylor discussed the relation of tar-fog removal to oxide purification and concluded that oxide purifiers served several very useful purposes in conjunction with electrical de-tarring plant. Among the purposes cited by the author were the removal of traces of fog that might pass de-tarrers not always working at 100 per cent. efficiency, the removal of fog which passed the de-tarrers as vapour subsequently condensing to fog owing to lowered temperature, and the partial removal of nitric oxide which forms gums with di-olefines. The mechanism of oxide purification was considered by Mr. H. B. Avery and he described an interesting discovery which he had made arising from the results of a series of laboratory experiments. He found that the sulphur deposited on repeated exposure of iron hydrate to hydrogen sulphide with re-vivification between each exposure is not mixed heterogeneously with the iron hydrate but the latter in some way remains on the surface of the sulphur particles.

The Thylox Process

THE last paper of the series, by Dr. G. E. Foxwell and Mr. Arthur Grounds, was an account of the Thylox process for the recovery of sulphur from gases containing hydrogen sulphide. The basis of the process is the absorption of the hydrogen sulphide by sodium thioarsenate forming a higher thioarsenate which on oxidation by air re-forms the lower thioarsenate and precipitates elementary sulphur. No Thylox plants have yet been erected in the British Empire, but there are ten in the U.S.A., six on the Continent and five in Japan. Operating results of the two latest installations in Japan showed that in one case the hydrogen sulphide content of the gas had been reduced to 8 grains per 100 cu. ft., and in the other substantially complete removal had been effected. The sulphur produced by the process finds many uses in industry and as an insecticide in agriculture. It contains a small proportion of arsenic (about 50 to 100 parts per million) but if this is objectionable it can be removed in a plant developed by I.C.I., Ltd. The authors pointed out that figures of operating costs show that the Thylox process must be limited to fairly large installations if it is to replace the oxide process on economic grounds and that the larger the plant and the greater the quantity of sulphur contained in the gas, the lower are the operating costs. They added that the Thylox process seems to have distinct economic advantages in the chemical industry (water-gas processes) as well as in the coke-oven industry and the larger town gas plants.

Steam Generation

STEAM generation is one of the most common industrial operations and yet only rarely is attention drawn to the basic parts played in the process by chemistry and chemical engineering. This is probably because it is only in the big installations, such as that of a power company, that the economies that can be effected by modern chemical and chemical engineering principles reap their own reward. The paper read by Mr. G. W. Hewson and Mr. R. Ll. Rees at the annual meeting of the Institution of Chemical Engineers described the economic refinements introduced by the application of these principles in large-scale steam generation. Four main subjects were considered: coal-sampling and its errors, the efficient combustion of coal on mechanical stokers, feed-water and boiler-water, and the removal of oxides of sulphur from flue gases. A notable feature of the paper, and one that is of interest outside the large generating station, was the authors' discussion of boiler-water and feed-water treatment with a most useful and original table showing the effects of various reagents in boilers.

Thylox Process for the Recovery of Sulphur from Gases Containing Hydrogen Sulphide*

By
G. E. FOXWELL, D.Sc., F.Inst.P., F.Inst.F., M.Inst.Gas E. and
ARTHUR GROUNDS, B.Sc., F.Inst.F., A.M.I.Min.E.

THE Thylox process has been for some years an established method for the purification of gas from hydrogen sulphide, but no plant has yet been erected in the British Empire. There are in existence to-day no fewer than 21 Thylox plants; of these, 10 are situated in the U.S.A., 6 on the Continent and 5 in Japan. The total capacity of the plants now in operation amounts to 350 million cu. ft. of gas daily. Calculated in terms of coal carbonised, the gas treated in the Thylox plants is equivalent to nearly 12 million tons of coal per annum; when it is remembered that the whole of the British coke-oven industry and the whole of the British gas industry carbonise some 18 million tons per annum each, the importance of the Thylox process begins to stand out in its true perspective.

Continuous operation has for many years past been one of the objectives of chemical engineering. Efforts have been made to extract the hydrogen sulphide from gas continuously, and to produce a finished product in the form of a directly saleable commodity. A new aspect of the old problem of liquid purification was the introduction in 1921 of the Seaboard process in which the gas was washed with a solution of sodium carbonate and bicarbonate. The soda solution absorbed hydrogen sulphide with the formation of sodium hydrosulphide and sodium sulphide, and was then regenerated by passing air through the washing liquid which caused the hydrogen sulphide to be liberated. Wholesale discharge of hydrogen sulphide into the atmosphere would not be permissible in this country. A development of the Seaboard process made it possible to recover the hydrogen sulphide in a concentrated form so that it could be treated in Claus kilns. It was considered preferable, however, not to convert the sulphur into sulphur dioxide, but to recover it in the elemental form, for which purpose the hydrogen sulphide was absorbed from the air used for regeneration in a suspension of ferric hydroxide in water in the form of ferric sulphide, from which the elementary sulphur was recovered by aeration.

This last phase of the Seaboard process led directly to the Ferrox process, in which the gas was washed directly with a suspension of ferric hydroxide in alkaline solution. This process was a distinct stage forward since the sulphur was recovered in elementary form, and therefore in the form in which it possessed the highest commercial value. The process, however, was found to have the considerable disadvantage that the washing liquid contained solid iron hydroxide, particles of which adhered to the sulphur, which was thereby so reduced in value that its use was practically confined to burning for the production of sulphuric acid.

This difficulty led to a systematic search for materials soluble in water which, by simple regeneration with air, would release the sulphur in the elementary form. The reagent sought for was found in sodium thioarsenate. This substance takes up hydrogen sulphide, forming a higher thioarsenate by addition of an atom of sulphur, and this, when oxidised by a current of air, is reconverted into the lower thioarsenate, one atom of oxygen taking the place of one atom of sulphur, the sulphur being precipitated in the elementary form. This process was known as the Thylox process, the outstanding advantage over other processes being that hydrogen sulphide was oxidised to sulphur in a clear solution, thus constituting a single-stage process.

The first Thylox plant on a large technical scale was built in the year 1926 for the Wisconsin Traction, Light, Heat and Power Co., in Appleton, Wis. (U.S.A.). In the following three years, thanks to the excellent technical results of the first plant and to the low operating costs, four more Thylox plants were erected in the United States of America. This is all the more remarkable as North America has rich sulphur deposits.

The first European Thylox plant was very much on the lines of the American Thylox plants. Soda served as alkaline component. The sulphur, which was recovered primarily as paste with a water content of about 40 per cent., and which

* From a paper presented at a joint meeting of the Chemical Engineering Group of the Society of Chemical Industry, with the Institution of Chemical Engineers, the North-Western Section of the Institute of Fuel and other Societies at Manchester on March 3.

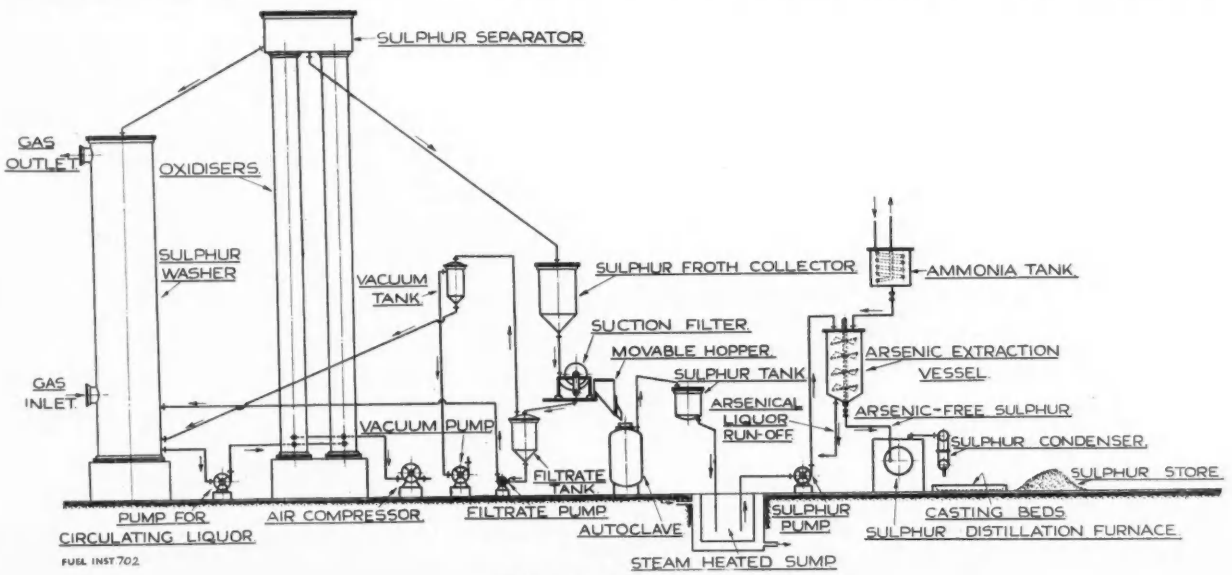
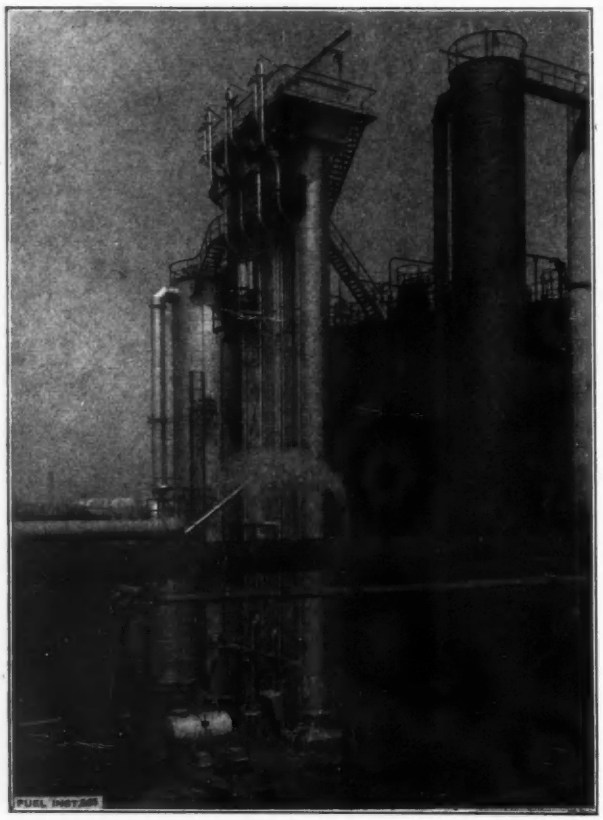


Diagram of Thylox plant.



Thylox plant for recovery of sulphur from gas. View of oxidising towers.

is used in dried form in the U.S.A. for fighting insect plagues, was re-melted in an open pan and cast into bars or blocks. A noteworthy improvement made at this time was the replacement of soda as the alkali by ammonia. This had the double advantage that ammonia is a product of coal carbonisation, and that the process was very considerably cheapened.

Experience at this first European plant also indicated that for the European market sulphur should be further purified. The open pans used for melting were replaced by autoclaves which accelerated the process of melting very considerably and led to simpler methods of handling. At a somewhat later date it was decided to distil the sulphur, and in this way a clear yellow product was obtained, similar in appearance and in value for most commercial purposes to the distilled natural product.

Description of the Thylox Process

The gas to be freed from hydrogen sulphide passes up the gas washer in counter-current to the Thylox solution. This solution contains some 5 per cent. of arsenic expressed as As_2O_3. The reaction which takes place in the scrubbers is basically :—

$$(NH_4)_3AsO_2S_2 + H_2S = (NH_4)_3AsOS_3 + H_2O$$

This reaction is quantitative, some 98 per cent. or more of the H_2S being absorbed. At the same time, most of the cyanides are extracted and are converted into thiocyanates, whilst a little thiosulphate is also formed. The washing solution is kept slightly alkaline with ammonia, and since a little of this ammonia is left in the gas it is recovered in a washer placed after the Thylox washer.

The washing solution is then heated to some 45° C., a temperature at which the succeeding regeneration of the solution takes place rapidly. The warm solution is then caused to flow up a high tower accompanied by a stream of air in parallel. The main reaction in this tower is :—

$$(NH_4)_3AsOS_3 + \tfrac{1}{2}O_2 = (NH_4)_3AsO_2S_2 + S$$

The regenerated solution is used again for washing the gas. The upward current of air carries the sulphur with it in the form of a froth to the top of the tower, where it forms a yellow scum which is collected in a sulphur separator. The sulphur is then dewatered on a rotary filter to give a product containing some 30-40 per cent. of water. This is then melted in the autoclave to separate the aqueous solution. In this form the sulphur contains a small amount of arsenic, and after distillation is suitable for many industrial purposes. It is often considered desirable to eliminate the arsenic down to the standard ruling for the imported product, and for this purpose a plant developed by Messrs. Imperial Chemical Industries is used wherein molten sulphur is washed under a small pressure with fresh ammonia solution that is later returned to the process. The product, still molten, is run into the sulphur tank in order that the liquor shall be separated, and is then distilled in the usual way.

The Chemistry of the Process

The chemistry of the process, as has been stated previously, is based upon the exchange of sulphur and oxygen, and is shown in principle by the following reactions :—

The Washing Reaction.

(1) $(NH_4)_3AsO_2S_2 + H_2S = (NH_4)_3AsOS_3 + H_2O$

Regeneration of the Washing Solution.

(2) $(NH_4)_3AsOS_3 + \tfrac{1}{2}O_2 = (NH_4)_3AsO_2S_2 + S$

These two reactions are equivalent to the basic reaction

(3) $H_2S + O = H_2O + S$

Reaction (1) takes place in the Thylox washer, wherein the hydrogen sulphide contained in the gas is fixed by the solution. Reaction (2) takes place in the oxidising towers. The oxygen in the air is utilised in this process to the extent of about 20 per cent.

In addition to the removal of H_2S, the hydrocyanic acid is also removed practically to the extent of 100 per cent. The hydrocyanic acid or its alkaline salts react in the weak alkaline solution to form thiocyanate salts, in accordance with the usual reaction :—

(4) $NH_4CN + (NH_4)_2S = NH_4CNS + (NH_4)_2S_{(x-1)}$,

the sulphur being supplied by the thioarsenic compounds.

A portion of the gas sulphur reacts to form thiocyanates, 1.2 kilos. of sulphur being needed for each kilo. of cyanogen. Another portion of the gas sulphur is used up in a secondary reaction, since thiosulphate is formed in the oxidising tower by the action of air. The thiosulphate reaction takes place in principle as follows :—

(5) $2(NH_4)_2S_2 + 3O_2 = 2(NH_4)_2S_2O_3$

The thiocyanate and the thiosulphate solutions together consume about 15 to 20 per cent. of the sulphur in the gas, so that the sulphur yield will vary according to the cyanogen content of the gas to be cleaned.

The formation of thiocyanate and thiosulphate salts withdraws a certain quantity of alkaline salts from the washing solutions, and this must be compensated by the addition of alkalies. The alkalinity is assessed by the *p*H-value.

On account of the formation of thiocyanates and thiosulphates the specific gravity of the Thylox solution will gradually increase so that the washing solution must be diluted with fresh solution from time to time. In order to maintain the volume of the liquid constant, it is necessary that at the same time a portion of the concentrated washing solution should be withdrawn. The washing solution so withdrawn is first de-arsenicated by the addition of sulphuric acid. The reaction takes place approximately as follows :—

(6) $\left.\begin{matrix}(NH_4)_3AsO_2S_2 \\ (NH_4)_3AsOS_3\end{matrix}\right\} + 3H_2SO_4 = As_2S_3 + 3H_2O + 3(NH_4)_2SO_4$

The As_2S_3 so formed is separated by filtration and is then dissolved in ammonia liquor and is returned to the washing process, whereby the thioarsenates are re-formed. The reformation takes place in the following manner :—

(7) $As_2S_3 + 6(NH_4)_2CO_3 + 3H_2O = 6(NH_4)HCO_3 + (NH_4)_3AsO_2S_2 + (NH_4)_3AsOS_3$

Sulphur is produced in the course of the Thylox process in three forms, namely, sulphur paste, melted sulphur and

distilled sulphur. On the Continent, the Thylox sulphur is sold in the form of distilled sulphur, this being produced as yellow blocks having an excellent appearance. In Japan and America the sulphur is generally sold as a dry sulphur paste. This paste is used in the Japanese rubber industry for vulcanisation. In Japan and in America it is used as an insecticide, commanding for this purpose a considerably higher value than the distilled product. This increased value for the sulphur paste is due to the exceedingly fine state of subdivision of the particles, which make it especially suitable as an insecticide. Thylox sulphur is also used in Germany for the manufacture of carbon disulphide. In Japan, while most of the sulphur is used in agriculture, a portion of the paste which is in excess of the agricultural requirements is melted and sold for the manufacture of dyestuffs. There seems no doubt that both in industry and in agriculture a great deal of our home requirements for sulphur could be met by purifying by the Thylox process the gases, produced in coke ovens, that are used in the metallurgical industry or sold for town's purposes.

South African Chemical Notes

From a Special Correspondent

Purchase of British Drugs and Chemicals

As a sequel to the exclusion of British firms from tendering for the supply of certain drugs for Onderstepoort, Mr. J. S. Marwick asked certain questions in the House of Assembly, and in reply Colonel Collins, the Minister of Agriculture, stated that of the drugs and chemicals bought by his department during the year ended March 31, 1938, for veterinary purposes 55.7 per cent. in value were from Great Britain, 5.4 per cent. from South African producers, and 38.9 per cent. from foreign countries. Replying to the questions to what extent, if any, British drugs were being banned by the veterinary division, the Minister said that it was obvious from the figures quoted that British drugs were being used to a large degree.

Iscor Develops its By-Products

Xylol, which is used by printers as a solvent for dissolving the better grade inks, is among the products of the iron and steel corporation in Pretoria, and large quantities of it are being sold to the Government printer. Previously this product was imported, but now it is possible for Iscor to produce all that it requires. In fact, so much of this by-product is being obtained that it is also being sold to other large printing firms in South Africa, and especially those specialising in high-grade work. Iscor is still developing its export trade to the United States in naphthalene tablets and flakes. It is likely that Iscor will increase its range of chemical by-products.

Over-working of Salt Pans

In the Darling district of the Cape the yield from a number of salt pans has fallen considerably, as a result of failure to rest the pans occasionally and on account of a number of dry seasons. In those pans in which continuous working has been followed it is now impossible to gain any salt, and some of the present producers that some years ago gave up to 50,000 bags of salt a year are now only yielding about 2,000 bags. It is now insisted that unless these pans are not touched for at least seven years they will never give profitable yields, and in spite of the fact that many of the salt merchants, wishing for present profits, are strongly opposed to this practice, the more enlightened salt farmers have decided to adopt this step, which should eventually prove beneficial. Most of the best salt sold in South Africa is imported, and that in spite of keen attempts to improve the quality of the local product and render it suitable for general use. The Board of Trade and Industries recommends producers to use triple effect vacuum pans to obtain the best results in the refining operations.

Letters to the Editor

The Five Day Week

From *Lord Trent.*

SIR,—Your firm is to be congratulated on the coming-of-age of its five day week. As you know, my own firm introduced the system experimentally at its new factory outside Nottingham five years ago, and the experiment proved so successful that it was soon made permanent. We have had no cause to regret the innovation which is highly appreciated by some 7,000 workers in our factories, and which in practice actually meant an increase rather than a reduction of output per working week.

The five day week in our case was the sequel to extensive reorganisation based upon the improvement of existing plant and the introduction of labour-aiding machinery in a new factory designed expressly for efficient production and dispatch. The general trend for nearly a century past has been in the direction of shorter hours in industry, but it is evident that a pre-condition of shorter hours must be some such extensive reorganisation of work, which necessarily entails substantial capital outlay. Without efficient organisation, shorter hours at the same wages would involve an increase of staff and a corresponding rise in costs—and therefore in prices.

For this reason movements for shorter hours of work can only gradually spread and cannot be compulsorily imposed without increasing prices to the consumer or weakening our ability to compete with foreign producers. On the other hand, it seems to me clear that increased mechanical efficiency and improved methods of organisation ought to make for a progressive reduction of working hours, whether in the form of a shorter week, longer holidays, or later entry into and earlier exit from employment. It is, indeed, mainly in this direction that we must look for the avoidance of that large-scale worklessness which, together with insecurity, constitutes the gravest blot upon our industrial system.—Yours faithfully,

TRENT.

Boots Pure Drug Co., Ltd.,
Stamford Street, S.E.1.

February 23, 1939.

Nephelene Syenite in Porcelain

An Advantageous Substitution for Feldspar

THE results of introducing nephelene syenite into porcelain are recorded by Koenig (*J. Amer. Ceram. Soc., 22*, 38-46). Mixes were made of the type usually employed for sanitary ware, but in which nephelene syenite was substituted for potash feldspar. These mixes were then fired in the normal way and the physical properties of the bodies produced were examined. It was thus discovered that syenite causes much higher vitrification than feldspar; indeed, an addition of 18-19 per cent. of the new material causes more vitrification than 25 per cent. of feldspar. A direct result of this is that syenite bodies show less warpage; they also possess very much lower absorption even when cast instead of being hand-moulded, and have a higher modulus of rigidity. The presence of syenite further causes the bodies to have a higher thermal expansion. An interesting property which is considerably altered in the ware by the introduction of syenite in place of feldspar, is the steel-like ring syenite bodies give when struck.

Fine-grinding of the syenite lowers the temperature at which it becomes active as a fluxing agent in the mixes and provides a longer maturing range. The warpage is still further decreased and the strength increased. This effect seems to be due to a reduction in the extent of formation of needle-shaped crystals of mullite.

The American Glass Industry

Economic and Technical Developments—Professor W. E. S. Turner's Address to the Society of Glass Technology

THE 200th meeting of the Society of Glass Technology was held in the new Lecture Theatre at "Elmfield," The Department of Glass Technology, Sheffield University, on February 15, the President, Dr. C. J. Peddle, M.B.E., F.I.C., F.Inst.P., F.S.G.T., in the chair, when Professor W. E. S. Turner lectured on "The Glass Industry in America, 1938."

Control in Hands of a Few Large Groups

Professor Turner referred to the changes in organisation and control that had taken place in the American glass industry during the years following the economic depression. The control had fallen into the hands of fewer and fewer groups, a system which had its advantages and risks. Outside these few large groups, the number of small companies was very limited. This grouping had taken place, partly by ambition and partly through the policy of avoiding internal competition, by which all their energy could be directed to the entry of other fields.

Following the financial crisis of 1930, the glass industry among the others suffered in the depression. It is interesting to follow the effect of the depression and of the recovery years on the production of glassware. The polished plate produced reached a peak in 1929, but then fell steadily until 1934; 1935 was a peak year, but since then production has been low until recently. The production of window glass, too, followed a similar fluctuation. However, one noticeable feature was that no matter how badly other branches of the industry were suffering, the container industry was always essential to foodstuffs and the production of bottles and jars had steadily increased since 1914. In general, the manufacturer of glassware in America felt uneasy. This uneasiness was not in any way related to the political situation but to the general condition of trading.

Professor Turner then commented on the American glass industry from a technical point of view.

Raw Materials

Sand.—In Ohio, a purification process involving mining separation tables and an acid wash had been developed. The method was successful in lowering the iron content of the sand below the maximum allowable limit.

Alumina.—The use of alumina as a constituent of mass produced glass has increased. Recently the felspars have had serious competition from nepheline syenite. This latter has a lower fusion point than feldspar, and weight for weight contains more alumina. The amount of alumina in glass has risen. A few firms use as much as from 3 to 5 per cent. Kyanite has been crushed and used as a batch constituent for alumina, but the general opinion seems to indicate that it is too refractory for satisfactory usage.

Barytes has been used for refining. Experiments carried out by one firm have shown that barytes has no advantageous refining action over sodium sulphate.

Batch Mixing and Charging.—It seems that firms are often willing to spend lavishly on plant that will save labour. In order to prevent trouble by segregation of the mixed batch, the unit hopper system has been widely adopted, although in certain instances it is questionable if it is correctly applied. A few firms have realised the value of maintaining about 2 per cent. moisture in the batch to assist mixing and melting.

Refractories.—Little new has been developed for pots, which remain in the background as far as glassmelting is concerned. Potmakers are divided in opinion as to whether the best pots are made from 100 per cent. American clay or with mixtures of European and American clays. As far as tank blocks are concerned, there has been a great deal of progressive work. Stimulated by competition from Corhart block, fireclay blocks have steadily improved. The process mostly used in their manufacture is slip casting. Particular attention is being directed to the grading of the raw clay and of the grog to give close packing of the particles. Cast sillimanite blocks have been developed soundly and technically by one firm, but by far their biggest use is for feeder parts and for the upper parts of the tanks. Corhart blocks are now extensively used, but recently two competitors have developed, the first (not yet a commercial proposition) is a block made from mixtures of BaO, MgO and SiO_2; the second is an electrocast product containing Al_2O_3, SiO_2 and up to 13 per cent. of Cr_2O_3.

Fuel.—There has not been much development here, except that oil firing is more favoured than hitherto. The reason for this is the desired simplicity of control. High pressure (160-200 lb./sq. in.) oil systems are favoured over the low or medium pressure systems.

Plant and Machinery

Furnaces.—Shallower tanks are being employed, and whereas, ten years ago, the depth of a colourless glass tank for containers and domestic glass was of the order of 42-48 in., to-day the general depth was seldom more than 36 in., and for special heavy duty tanks the depth of the melting end is 22-24 in.; the working end is shallower. There has been a progressive rise in the temperature of operation, and this is now about 2,700-2,800° F. Great care is taken in the maintenance of the correct temperature schedule by a team of skilled operators. The increased use of sillimanite in the upper structure of the furnace has been due to the increased temperature of operation. This has naturally been accompanied by increased corrosion of the walls of the tank and regenerator packings. Corhart blocks are widely used for port sills, arches and breastwalls, and their increased employment is again due to the increased temperature of working. For small tanks (output 30-50 tons/day), end port firing is coming into favour, this reduces the wear on the walls by using a long flame. The method of control of tanks has proceeded to a more advanced stage. In one case the gas and air were metered, each port being treated as a separate unit, with separate valves for gas and air together with pressure gauges for each.

Machinery for Glass Making.—In gravity fed machinery there has been no revolutionary change, but in every case there has been a speeding up and a refining of these machines. A pressed glass article (weight 8 oz.) was, in one case, manufactured at 44 per minute. The Corning ribbon machine was making small electric lamp bulbs at the rate of 720 per minute. Another similar machine was making blown tumblers at the rate of 150,000 per day. This speed up was not confined to container ware. Drawn sheet by the Libbey Owens process was being manufactured at about twice the speed of that in 1919.

Developments in Domestic Glassware

Domestic Glassware.—Here there has been an invasion of the pottery field, and dense opal glass has been made into domestic "china" ware. Sprayed glassware also has been used in tea services, etc. There has also been a wide development in the use of enamelling as a decoration in domestic ware. This usage is not so wide in the case of milk bottles. In the better quality crystal glass more attention has been paid to the glass and decoration was simple in style.

In conclusion Professor Turner described briefly the development and manufacture of glass fibres for textile use and for insulation purposes.

Institute of Chemistry

Annual General Meeting — Sir Robert Pickard's Review of the Institute's Activities — Election of Officers

AT the sixty-first annual general meeting of the Institute of Chemistry held in the hall of the Institute, Russell Square, on Wednesday, SIR ROBERT PICKARD, the retiring President, in moving the adoption of the annual report of the Council, drew attention to the fact that the membership consisted of over 7,200 qualified chemists. He said that the finances of the Institute were in a sound position, and the Benevolent Fund, which is financed quite separately, had done well, by maintenance grants and loans, to members and to the relatives of deceased members. A pleasant feature was that although the loans were made to those who were temporarily embarrassed, only about 31 per cent. of such amounts had been written off, the bulk having been returned by those whose circumstances had improved.

Mr. W. A. S. Calder, M.I.Chem.E., President-elect of the Institute of Chemistry.

Petition for a Supplemental Charter

The Council was endeavouring to obtain the consent of the Fellows and Associates to a Petition for a Supplemental Charter embodying a scheme for the registration of those chemists whose qualifications were the same as those required for admission to the Institute, but who did not wish to become fully associated with its work. It was, in his view, a scheme proposed in the best interests of the Institute, of the profession as a whole, and of the State, and the matter would receive further consideration during the present year.

The Institute had no politics, but it was incorporated by Royal Charter and enjoyed the Patronage of the Sovereign. It should be ever ready to render assistance to the State. He thought that chemists would sympathise with the views expressed in the statement recently issued under the names of a group of eminent public men, including leaders in science, as an appeal to men of goodwill in other countries to preserve our civilisation and, in the spirit of co-operation, to set about finding a lasting solution to the difficult international problems with which the world is faced to-day. He also referred to the new Division of the British Association for the Advancement of Science, formed for the study of the social and international relations of science, and to encourage the application of science to promote the well-being of society. That Division, he thought, arose from considerations which included the prevention of war, the preservation of civilisation, and generally the promotion of higher human ideals, having special regard to the influence of science in all such matters.

It was increasingly difficult for succeeding generations to acquire the ability to control efficiently the power that knowledge gives. Any attempt to overcome, even partially, the inevitable lag in this respect between one generation and the next, implied the necessity for revising the methods and extending the periods of education; and in that connection, for insisting, above all, on right and clear thinking in relation to the whole business of life.

However, it was an unfortunate necessity that we must be prepared to defend ourselves, and he (the President) referred to the possible utilisation of the services of chemists in any national emergency. The position of the country, so far as the supply of chemists and the condition of the chemical industries was concerned, was very different from that of 25 years ago; but war usually brought unexpected demands, and chemists should be content to know that an organised effort was being made which would direct their skill and willingness to serve the country into the most advantageous channels.

The local sections were to be congratulated on their activity and on the interesting and valuable lectures which had been read before them during the past year. The lectures given at headquarters, by Dr. R. Alan Morton, Professor F. M. Rowe, Mr. J. R. Nicholls, and Dr. W. H. Hatfield, and published as separate monographs, were also greatly appreciated.

The entries for the examinations of the Institute had increased, but the percentage of successes had not been maintained.

The Appointments Register continued to give valuable service, both to employers and chemists, and, on the whole, the Institute was fortunate that, in times like the present, less than 1.2 per cent. of its members were known to be without employment, and only a small proportion of those had been unemployed for any long period.

The President directed attention to the third annual report of the Chemical Council, recently published. This body, on which the Institute is represented, had under consideration a scheme, the object of which was to distribute the burden of the cost of publications of the Chemical Society and the Society of Chemical Industry more equitably over the membership of all three chartered chemical bodies. The President appealed to all chemists to support the publishing societies, in order that they might be placed on a sounder financial basis, and their publications continued to the advantage of all who were interested in the science and profession of chemistry.

In conclusion, he said that he would retire from the presidential chair with every confidence in the continued vigorous growth of the Institute under the guidance of his successor.

The Meldola medal, the gift of the Society of Maccabæans was awarded to DR. WILLIAM CHARLES PRICE.

Election of Officers and Members of Council

MR. W. A. S. CALDER was elected President in succession to Sir Robert Pickard, and the other officers and members of Council were elected as follows:—

Vice-Presidents: Professor H. V. A. Briscoe, Dr. F. H. Carr, Professor T. P. Hilditch, Dr. G. R. Lynch, Dr. C. A. Mitchell and Sir Robert H. Pickard.

Hon. Treasurer: Mr. B. F. Howard.

Members of Council: Mr. W. M. Ames, Mr. A. L. Bacharach, Mr. M. Bogod, Dr. O. L. Brady, Mr. R. R. Butler, Mr. W. J. A. Butterfield, Dr. H. E. Cox, Dr. W. M. Cumming, Mr. W. A. Damon, Dr. G. M. Dyson, Mr F. G. Edmed, Dr. E. H. Farmer, Dr. A. Findlay, Dr. A. G. Francis, Mr. W. Godden, Dr. P. F. Gordon, Dr. A. A. Hall, Mr. J. W. Hawley, Dr. H. H. Hodgson, Mr. T. R. Hodgson, Dr. W. Honneyman, Dr. R. H. Hopkins, Dr. H. Hunter, Mr. J. R. Johnson, Mr. G. King, Dr. L. H. Lampitt, Mr. J. H. Lester, Mr. E. Lewis, Mr. B. G. McLellan, Mr. H. W. Moss, Dr. T. J. Nolan, Mr. D. W. Parker, Dr W. S. Patterson, Mr. F. M. Potter, Mr. A. J. Prince, Professor F. M. Rowe, Dr. R. E. Slade, Dr. H. A. Tempany, Dr. D. F. Twiss, Mr. S. B. Watkins, Dr. J. Weir and Dr. B. Wylam.

Surface Treatment of Metals

Protection Afforded by Different Methods

DR. F. C. B. MARSHALL in a paper presented at a recent meeting of the Manchester Section of the Oil and Colour Chemists' Association pointed out that metal corrosion is really of two types: first, is that of direct attack by oxidation. The attack is slow, and will continue indefinitely if the oxide coating is progressively removed. If, however, the oxide coating is allowed to remain undisturbed it will be hard and well adhered to the surface, and act as an anti-corrosive film. This kind of corrosion is, however, not very frequently encountered. The second type, electrolytic corrosion, is by far the more important. The formation of a simple electric cell between two different metals immersed in a solution of an electrolyte is the essential condition to give rise to this type of corrosion. With two metals in contact in ordinary dirty water, the necessary conditions exist, corrosion sets up by the metal exerting the greater solution pressure forming the anode and being dissolved, whereas the other metal forms the cathode and becomes hydrogen coated and protected. Difference in potential can occur in areas in the same metals, and may be due to rolling stresses or small differences in composition. This is sufficient to produce the conditions for rusting of the metal. The presence of salt in solution has the effect of speeding up the process of corrosion. Sodium hydroxide is formed at the cathode and this, in the case of a paint film, creeps under and attacks the paint from below. In this way, the paint is loosened from the metal, and ceases to be effective, caused by the penetration of moisture under the skin itself.

Difficulties Presented by Electrolytic Corrosion

The diversity of conditions which can give rise to electrochemical corrosion render it most difficult to ensure immunity from corrosion. In this respect even after the most careful preparation of surfaces, such things as the different concentrations of dissolved gases in the electrolyte can set up anode and cathode. It is to such conditions as these that the preferential corrosion of high points on a surface rather than the depressions may be attributed. It is clear that what is required is a coating which will satisfactorily exclude air from the metal surface. In this respect, nickel plating and aluminium paint show definite breakdown. Other treatments include electrically applied metal coats, galvanising and tinning, sherardising, in which the metal is rotated in heat, zinc dust, and metal spraying. Non-metallic coatings which are employed may be vitreous enamel, glass lining, rubber or bituminous compositions. These are particularly used for chemical plant where paint is impracticable.

Paint is the most important non-metallic coating since it can be easily applied and combines both protective and decorative properties. Any number of coats can be applied, whereas in the case of plating, the process must not be carried out too long, and if arrested at too early a stage, cannot be added to without special treatments and difficulties. Again, defective plating cannot be repaired, but in the case of paint this is comparatively easy. Paint, however, has the great disadvantage of lack of mechanical strength and will at once pave the way for a quick breakdown. A clean surface and good paint are not sufficient and something with better adhesion and greater strength is needed.

An oxide film of the metal in molecular contact fulfils the conditions and, in addition, provides a very suitable ground on which to apply paint coatings. An example of this oxide protection is given by mill scale, which acts as a protective layer on the metal. Unfortunately, its spongy nature and the fact that it is rather loose renders it of no practical value for a painting basis. One of the early processes for the production of a suitable surface coating involved the treatment of the metal by means of super-heated steam at a temperature of 900° followed by exposure to coal gas. This process was lengthy and not too reliable in its results. Later, the phos-

(*Continued at foot of next column.*)

Plastics and their Uses

Possible Future Commercial Importance of Present Lesser-Known Products

SOME of the plastic materials which have now been developed in practical form appear to have so complicated a series of chemical reactions on paper that it is surprising that they have ever emerged from the laboratory. This view was put forward by Mr. George Dring, M.A., B.Sc., F.I.C., Development Manager of Bakelite Ltd., in the course of a paper on "Plastics and Their Uses" at the Heriot-Watt College, Edinburgh, on February 24. The particular type of plastic which inspired this opinion was methyl methacrylate, which yields an organic glass and which the lecturer thought a typical example of the laboratory product of one generation becoming the industrial product of the next. For this reason, Mr. Dring was particularly careful when dealing with some of the lesser known and, at present, unimportant resins to stress that some of them in the not too distant future might possibly attain a leading position in the plastics industry.

The lecture was divided into two sections dealing with the thermo-plastic resins, i.e., those which are capable of being softened by heat, and the thermo-hardening type which, once they have been hardened by heat, as in the moulding process, are no longer responsive either to heat or to solvents. All the natural resins such as shellac, dammar gum and bitumen are included in the first group, as well as the cellulose plastics and acetylene derivatives such as vinyl, styrol and methyl methacrylate resins. The lecturer dealt with the characteristics of each of these resins and their present uses in industry. Although many of these thermo-plastic resins play an important part in industrial practice, the heat hardening group is of major importance; these include phenol formaldehyde and urea formaldehyde plastics.

The method of producing moulding materials from these resins by grinding them to powder and mixing them with fillers was explained, together with the production of laminated materials which comprise sheets of paper or fabric impregnated with the resin and pressed into a homogeneous board under heat and pressure. The lecturer expressed the view that expansion of the applications of plastics would continue for many years.

(*Continued from preceding column.*)

phate coating was developed, whereby the zinc grey matt finish obtained by immersion of the metal in hot solution gave a very suitable ground for painting.

An early process consisted of a solution of cast iron borings in phosphoric acid; this was diluted, and the article then immersed. After about three hours, a dark green coat was developed and this, when oiled, produced a jet black finish. The process, however, was slow and not reliable, the solution often failing to function. From this beginning, an American development resulted in the Parkerising process, where a powder consisting of mixed phosphates is supplied to be dissolved in hot water for use. This is so balanced as to make necessary only keeping the bath up to strength with additional powder, the quantity being determined by titration. The process has the disadvantage that it takes about an hour to obtain the best results, and modern mass production methods call for something quicker. Addition of copper to the solution accelerated the result, but it was found to have certain disadvantages. The use of non-metallic catalysts was found to give much greater speed of reaction, and the use of iron, zinc, or manganese as the modern "Bonderising" process provides a method which is quick and which deposits a film thin enough to be of no detriment to engineering tolerances. In this process, the bath is so regulated that the coating only builds to a given thickness after which no further deposit takes place. Spray bonderising is carried out in tunnels on mass production work, and takes only about one minute for application, producing a suitable surface for painting.

Attack of Metals by Fatty Acids

Conditions Affecting Acetic Acid Corrosion of Copper

AN interesting report on the manner in which metals are attacked by fatty acids has been presented to the French Academy of Sciences by Dubrisay and Goupil (*Compt. Rend.* 207, 1,101). In principle, the authors state, fatty acids only attack metals superficially *in vacuo*. In air, if the acid covers the metal entirely and no water is present, no attack seems to take place. Tests were made with a 5 per cent. solution of acetic acid in water and in distilled xylene. Copper strips were placed in test tubes and covered with the solutions so that in the first tube the copper was entirely covered with xylene solution; in the second, half covered with xylene solution and half exposed to the air; in the third, half covered with aqueous solution and half with xylene; in the fourth, entirely covered with aqueous solution on the top of which xylene floated without touching the copper; in the fifth, entirely covered with aqueous solution; and in the sixth, half covered with aqueous solution and half exposed to the air. After two months, the copper in the first tube was found unattacked; in the second a deposit amounting to 0.045 mg. was found on the exposed part; in the third the aqueous solution contained 0.030 mg. of salt in solution with a deposit of 0.011 mg. on the copper immersed in the xylene solution; in the fourth there was a solution of 0.005 mg. of salt in the water layer; in the fifth there was 0.008 mg. of salt in the aqueous solution; and in the sixth there was 0.031 mg. of salt in the aqueous solution and on the exposed part of the copper there was a deposit of 0.06 mg. The results show that when the metal is completely immersed in one liquid, there is little or no attack; when two liquids touch the metal, an Evans battery would seem to be formed, the copper being attacked electrolytically with salt formation.

A NEW METHOD OF WATERPROOFING

A new method of waterproofing cloth by the use of compounds containing the group $CH_2 = C <$ is described by Rohm and Haas A.G. (Fr. P. 829064). The product chosen can be used in solution in an organic solvent but such solutions are extremely viscous even at low concentrations. They have a tendency to shrink the cloth and produce a starched effect. Aqueous solutions are rather too fluid. The patentees state that a colloidal aqueous dispersion of the substance in an organic non-solvent gives a pasty mixture which is free from the drawbacks of both the aqueous solution and of that in organic liquid. As an example a mixture of an aqueous dispersion of polymethyl acrylate (60 parts) with amyl acetate (40 parts) is cited. The dispersion should contain at least 40 per cent. dry residue. This mixture gives a translucent paste which can be applied to cloth with a brush. Instead of amyl acetate, butyl acetate or propyl butyrate, can be used. Other mixtures given are: 62.5 parts of an aqueous dispersion of polybutyl acrylate, 20 parts of trichlorethylene and 17.5 parts of monochlorobenzene; and: 50 parts polyvinyl acetate in aqueous dispersion, 25 parts of methylene chloride and 25 parts of butyl acetate.

THE successful utilisation of volcanic ash as a constituent of glazes is reported by Plummer (*Bull. Amer. Ceram. Soc.*, 1939, *18*, 8-11). The ash used analysed 72 per cent. SiO_2, 1.5-2.3 per cent. Fe_2O_3, 13.6-14.5 per cent. Al_2O_3, CaO-MgO 1.0 per cent., K_2O 2.0 per cent., Na_2O 4.0 per cent. This material was used to replace the feldspar and a portion of the silica, and was employed in amounts up to 57 per cent. of the total weight of the raw ingredients. No significant difference was observed in the glazes produced from volcanic ash and from ordinary materials except for a slight variability in the colour due to the iron in the ash. The ash is very cheap and should find application in glazes for roofing tiles, wall tiles, and for low priced pottery.

Temperature-Indicating Paints

A Range Developed by the I.G.

IN connection with their fuel research work at Oppau the I.G. have had occasion to carry out numerous temperature determinations in aircraft engine cylinders and other parts, and it has been found that the making of several individual measurements in various parts of the cylinder was very tedious and not altogether satisfactory. It was therefore decided to try and find suitable paints which would change colour at fairly definite temperatures. The idea is not altogether new. Pinnock, for example (*J.S.C.I.*, 1919, *38*, 78), described the use of paints for applying to bearings and other parts of machines liable to become heated. These paints, consisting for the most part of double iodides of mercury and copper, or mercury and silver, were not, however, suitable for temperatures above 80° or thereabouts; nor was the colour change permanent, but reverted on cooling.

Much more severe and drastic conditions have had to be provided for at Oppau. In the first place the relevant temperatures are very much higher—over 400° C.—and in the second place it was absolutely essential that the colour changes should be permanent, and should moreover be sharp and definite and indicate temperatures within an error margin not exceeding ±5°. This margin was quite permissible under the circumstances, and if a more exact temperature determination was required at any point this could be effected by the usual methods with thermo-couples.

The precise composition of the thermo-colours developed has not yet been disclosed, except that they are mostly metallic salts, but the following list gives those which have so far been prepared, with colour changes and corresponding temperatures:—

No.	Colour change	Temp. °C.
1.	Rose to blue	30
2.	Light green to blue	60
3.	Light yellow to violet	110
4.	Purple to blue	140
5.	White to greenish brown	175
6.	Green to dark brown	220
7.	Yellow to reddish brown	290
8.	White to light brown	340
9.	Violet to white	440
20.	Light rose (pink) to light blue	65
	Light blue to light brown	145
30.	Light green to light blue	65
	Light blue to olive green	145
	Olive green to greyish brown	220
31.	Brown to greyish brown	155
	Greyish brown to greenish brown	230
	Greenish brown to reddish brown	275

An important part of the initial work was the discovery of a suitable medium, and this was ultimately found in an alcohol-soluble synthetic resin. The alcohol solution ensures a rapidly drying paint, a very essential desideratum. The resin chosen is stable at the high temperatures used, ensures good adhesion, and does not in any way affect the colour changes.

An interesting account of the work at Oppau, including illustrations in colour, is given in the *Zeit. des Vereins Deutscher Ingenieure* for January 21, 1939, pages 69-74, by Dip.-Ing. Fritz Penzig.

IRON PYRITES IN INDIA

Extensive iron pyrites deposits have recently been discovered in the Simla Hills, India. In the opinion of an expert who inspected these deposits at the suggestion of the United Provinces Government, the quality of the ore (as regards its sulphur and arsenic contents) compares favourably with iron pyrites found elsewhere in the world. It is believed that this find of such large iron pyrites deposits in India is the first of its kind. The discovery is of significance as the ore will tend to replace imported sulphur.

NEW TECHNICAL BOOKS

LABORATORY METHODS OF BIOCHEMISTRY. By A. Bertho and W. Grassmann. Translated by W. McCartney. Pp. 281. London: Macmillan & Co., Ltd. 18s. net.

The joint authors of this practical treatment of what is a relatively new branch of organic chemistry have endeavoured to meet the urgent wishes of many who desire to study biochemistry more closely than has hitherto been possible. Apart from this they have also considered the need of universities and colleges, where, in the absence of a suitable practical text, biochemistry has been only incompletely studied, and, indeed, often wholly neglected. The present work can be regarded as a companion volume to Gattermann and Wieland's "Laboratory Methods of Organic Chemistry," a similar general procedure in the treatment of the subject having been adopted. Following a "general introduction" to the subject, written by the two authors jointly, wherein chemical processes which occur in nature are generally reviewed, there is a chapter on "general technique" with a detailed account of the use of apparatus and of general experimental procedure as dictated by the demands of biochemical investigation; users of Gattermann and Wieland's book will remember a similar plan adopted there. The remainder of the book, covering "biological materials and transformation," is divided into three main divisions, namely, substrates, enzymic hydrolyses, and respiration and fermentation. The section on substrates has been written by Grassmann, who discusses substances which are studied by organic chemists (and their detection and determination) only so far as necessary for an understanding of biochemical enzymic transformations. Nevertheless, a few experiments and remarks on vitamins and hormones are also included, mainly because users of the book will be interested in the constitutions of these remarkable substances.

Of the other two sections that concerning enzymic hydrolyses has also been written by Grassmann, whereas respiration and fermentation has been dealt with by the joint author, Bertho. In both of these sections the respective authors have endeavoured to give an account of all that has so far been discovered, and it appears that they have presented their subject very systematically from the point of view of the student. In co-operation with predecessors in the academic posts they hold, the authors have very successfully used a great part of the material given in this book for a course of practical biochemistry at the University of Munich, one half day per week being devoted to the subject. They found that advanced students of chemistry, working jointly with young medical students who are concerned particularly with physiological problems, had the experience of a course which was both informative and stimulating. Advanced students of organic chemistry will be mainly interested in that section of the book which covers respiration and fermentation, for herein are discussed such subjects as the biological activation of hydrogen, acetic bacteria, alcoholic fermentation, the mechanism of glycolysis, and bacterial lactic acid production to name a few features picked out at random. The section on "general technique" (written by Grassmann) contains much information which will not readily be found elsewhere, if at all, and even so, certainly not presented in such an intelligible manner. Here there is an interesting discussion of general methods of purification, including dialysis and ultra-filtration, and purification by adsorption (together with details of preparation for the most important alumina gels), centrifuging and clarifying; all research workers in organic chemistry will find this particular section enlightening.

To obtain tungstic acid with only a trace of molybdenum, a solution of ammonium tungstate (s.g. 1.29-1.32) is evaporated in presence of an excess of ammonia until reduced to about one-tenth of the original volume. The resulting precipitate of ammonium paratungstate is then converted into tungstic acid in the usual manner (Russ. Pat. 48,280 to W. M. Kotliar).

RECENT TRADE LITERATURE

THE CAMBRIDGE INSTRUMENT CO., LTD., have issued a leaflet describing their range of thermo-electric recording pyrometers for temperatures up to 1,400° C. and 2,550° F. The leaflet also describes indicators and thermo-couples and sheaths.

HIGGS MOTORS, LTD., have issued a pocket stock list (No. 180) which gives in a concise and convenient form a summary of the motors, dynamos, control gear, etc., which they hold in stock. The machines listed inclue A.C. motors (three phase, two phase and single phase), D.C. motors and D.C. dynamos.

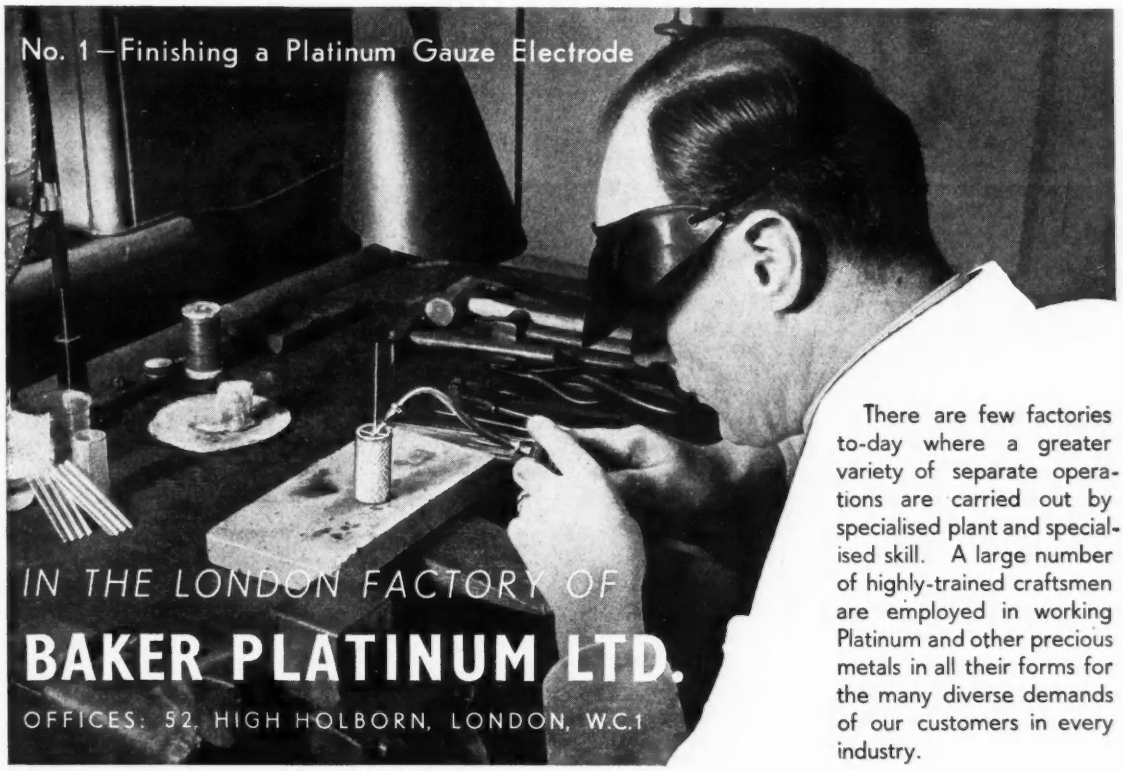
A complete catalogue of the chemical plant manufactured by the KESTNER EVAPORATOR AND ENGINEERING CO., LTD., has been compiled by the company. Bound in attractive blue covers it actually comprises a series of small leaflets which have been issued periodically by the company to describe individual plant. The leaflets have been bound together in numerical order and, complete with index, provide a very readable work of reference.

In 1933 ASHMORE, BENSON, PEASE AND CO., LTD., licensees of the International Meehanite Metal Co., Ltd., were the first to introduce the manufacture of Meehanite metal in this country, and since then, according to a folder recently issued by the company, their output of Meehanite metal castings has shown a consistent increase. Specimens of Meehanite castings, including a centrifugal pump and a half base for a gas generator, are illustrated in the folder, which also gives technical details of the material.

REDLER CONVEYORS, LTD., have issued an interesting 32-page catalogue in connection with their conveyor-elevators. Fundamentally a new development, the Redler conveyor-elevator is claimed to open up tremendous possibilities in handling powdered and granular materials (e.g., chemical products) cleanly, gently and economically. Materials flow in a solid, compact column wherever the enclosed steel casing of the machine leads; horizontally, up inclines, vertically or even around bends. The conveying element is an endless series of closely spaced skeleton flights. The shaped arms cause the boundary layer of material to travel with the conveying element, while the remainder of the load naturally moves with the boundary layer.

The engineering supplement to the *Centurian,* the quarterly review of ELLIOTT BROTHERS (LONDON), LTD., contains an article on remote control equipment, a review of the Elliott remote control and transmission systems with some of their applications. Clearly illustrated by diagrams and photographs, the article deals with the systems of remote control and indication equipment with ring tube transmission, remote control and indication equipment position transmitter type, and remote control equipment with Shotter transmission. A hypothetical case is taken to illustrate the facilities obtainable by a combined manual remote control and remote indication system. The description of remote automatic control has been based on its application to water pumping equipment, but it is equally suitable for other applications.

Three new folders, "Stelliting Wearing Parts of Mining Machinery," "Stelliting Plowshares by the Oxy-Acetylene Process," and "Stelliting Wearing Parts of Steel Producing and Fabricating Equipment," have been added to the "Hard-Facing Data Sheets" published by INTERNATIONAL STELLITE CORPORATION. Each of these folders presents detailed recommendations for applying Stelliting rod, the wear-resistant cobalt-chromium-tungsten hard-facing material, to important wearing parts of equipment. Sketches and illustrations help to show how each step of the surfacing process is accomplished efficiently and economically to increase the life of wearing parts from 3 to 10 times. Copies of any one or all of these folders, bound in a convenient loose-leaf cover, are available upon written request to International Stellite Corporation, New York, N.Y., U.S.A., or from authorised distributors of International Stellite Corporation products.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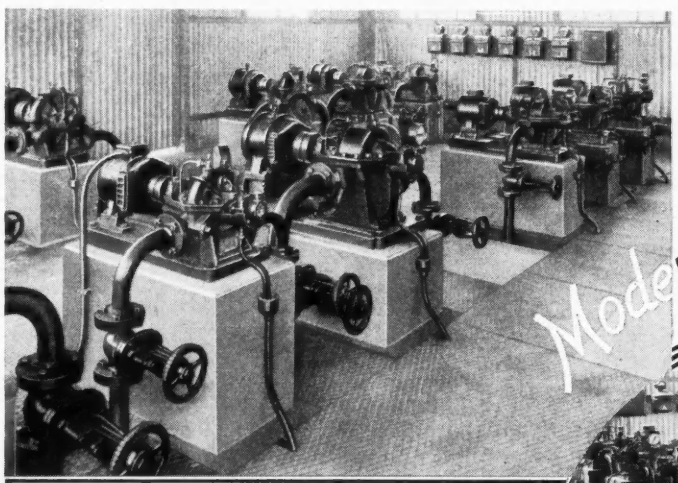

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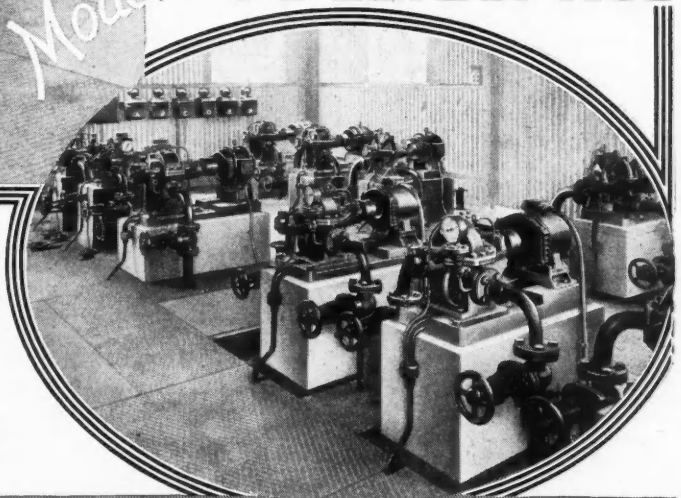

The two illustrations show twelve electrically-driven Horizontal Split Casing Centrifugal Pumps installed at the Oldbury Works of the Midland Tar Distillers Ltd., Birmingham. These units handle a variety of chemical solutions used in various manufacturing processes.

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Industrial preparation of carotin. Ungnade, *Chem. Ztg., 63,* 9-11.

Carbohydrate chemistry. Michael, *Angew. Chem., 52,* 6-17.

Action of sulphur in catalytic high pressure hydrogenation. Fuchs and Brendlein, *Angew. Chem., 52,* 49-58.

Chemistry and toxicology of solvents. Flury, *Chem. Fabrik, 12,* 3-6.

Glycerine. Dalton, *Soap, 15,* No. 1, 21-23, 69.

Oxy-acids and oxidized acids. Dieterle, *Seifensieder Ztg., 66,* 1-2.

Influence of glucinum, magnesium, zinc and cadmium bromides on the bromination of benzene. Roger and Pajean. *Compt. rend., 207,* 1,420-1,422.

Analysis

Separation of cobalt and nickel from manganese. Ostroumov and Maslenikova, *Ind. Eng. Chem. analyt. ed., 10,* 695-696.

Estimation of cadmium in zincblende. Kraus and Novak, *Coll. Czech Chem. Commun., 10,* 535-541.

Determination of ferrocyanides and arsenious acid. Lang, *Z. analyt. Chem., 115,* 103-104.

Analysis of gas mixtures by the desorption-heat conductivity method. Edse and Hartek, *Angew. Chem., 52,* 32-33.

McNicoll method for determining rosin in soap. Randa and Boley, *Oil and Soap, 15,* 313-315.

Direct determination of sodium oxide in feldspar. Koenig, *J. Amer. Ceramic Soc., 22,* 24-31.

Bromate in volumetric analysis. Smith and May, *J. Amer. Ceramic Soc., 22,* 31-33.

Analysis of nitrocellulose lacquers. Scheiber, *Farbe u. Lack,* 1939, 3-4.

Rapid analysis of synthetic resin paints. Strauss, *Paint Varnish Prod. Manager, 19,* 4-5.

Mineral Oils, Gas, Tar

Removal of nitric oxide from gas. Harth and Muser, *Gas u. Wasserfach, 81,* 890-894.

Hydrogen sulphide purification of gases. Sümegi, *Gas u. Wasserfach, 82,* 4-7.

Distillation and refining of mineral lubricating oils. Kadmer, *Petroleum Z., 35,* No. 1, 16-20.

Cleaning of lubricating, cooling and cutting oils. Deitmers, *Petroleum Z., 35,* No. 3, 33-35.

Viscosity and constitution. Hugel, *Oel u. Kohle, 15,* 27-29.

Behaviour of hard coal on heating. Macura, *Oel u. Kohle, 15,* 1-12, 45-54.

Manufacture of cutting oils. Miller, *J. Inst. Petroleum Techn., 24,* 645-649.

Cellulose, Paper

Oxidation of sulphite waste lyes. Schwabe and Lagalby, *Wochenblatt f. Papierfabrik, 69,* 1,037-1,041.

Constitution, crystal structure and texture of cellulose. Meyer, *Osterreichische Chem. Ztg., 42,* 7-10.

Degree of polymerisation of cellulose in foils and the breaking down of the cellulose in the viscose process. Staudinger and Reinecke, *Papier Fabrik. (techn. Teil), 36,* 557-559.

Bleaching, Dyeing, Finishing

Surface tension and the scouring action of soaps. Henk, *Seifensieder Ztg., 66,* 2.

Effect of alkalies in scouring. Foulon, *Seifensieder Ztg., 66,* 2-3.

Manufacture and dyeing of lanital. Malard, *Dyer, 81,* 19-22.

Dyeing of wool with vat dyes. Dutoit, *Teintex, 4,* 17-21.

Loss of hydrogen peroxide in bleaching. Bonnet, *Teintex, 4,* 22-26.

Impermeabilizing treatments for wool. Gordon-Abramov, *Rev. Générale Matières Colorantes, 43,* 27-30.

Tinctorial function of component acid dyes. Ellis, *Text. Colorist, 61,* 14-16.

Progress in the manufacture and dyeing of paper. Bancroft. *J. Soc. Dyers Colourists, 28,* 11-13.

Synthetic substitutes for wool. Crow, *Silk and Rayon, 13,* 144-146.

Glass, Ceramics

Safety glass. Long, *Verre Silicate Ind., 10,* 13-17.

Scorification of fireproof bricks. Endell, *Ber. Deutschen Keram. Ges., 19,* 491-513.

Working up of kaolin and clay. Gerth, *Ber. Deutschen Keram. Ges., 19,* 513-528.

Viscosity and electrical resistivity and the nature of glass. Taylor, *J. Amer. Ceram. Soc., 22,* 1-8.

Elastic properties of Jena glass. Kunert, *Glastechn. Ber., 16,* 383-386.

Metals, Electrometallurgy

Anodic behaviour in alkaline plating solutions. Graham, *Amer. Electroplater's Soc. Monthly Rev.,* 1938, 905-909.

Galvanising of steel. *Metal Treatment, 4,* No. 15, 102-107.

White brass plating process. Oplinger, *Metal Ind., 54,* 167-169.

Fats, Oils, Waxes

Higher fatty alcohols. Mullin, *Soap, 15,* No. 1, 27-29, 70.

Chemical engineering in the essential oil industry. Dyson, *Perf. Essential Oil Rec. Annual No.,* 1938, 3-17.

Distillation and rectification of essential oils and synthetics. Dyson, *Perf. Essential Oil Rec. Annual No.,* 1938, 18-23.

Oil hardening with copper-nickel catalysts. Normann, *Fett u. Seifen, 45,* 664-669.

Paints, Pigments, Resins

Modern strippers. Ohl, *Seifensieder Ztg., 65,* 1,031-1,033.

Oil emulsions in paint technology. Wagner, *Fette u. Seifen, 45,* 676-680.

Heat hardenable artificial phenolic resins in the varnish industry. Hönet, *Fette u. Seifen, 45,* 682-684.

Aeroplane dopes. Gesch, *Farbe u. Lack,* 1938, 605-606.

Anti-corrosive paints: red lead. Stuart, *Paint Manuf., 9,* 16-19.

High temperature application of nitro-cellulose lacquers. Nelson, *Ind. Eng. Chem., 31,* 70-75.

Rubber, Plastics

Vegetable caseins, glue and gelatine. Delorme, *Rev. Générale Matières Plastiques, 14,* 330-334.

Action of organic solvents on high molecular substances. Moll, *Kolloid Beihefte, 49,* 1-74.

Protein plastics from soybean products. Brother and McKinney, *Ind. Eng. Chem., 31,* 84-87.

Miscellaneous

Chemotherapy. Lucas, *Canadian Chem., 22,* 555-558.

Phosphates in detergency. Gillet, *Soap, 15,* No. 1, 24-26, 69.

Personal Notes

MR. M. A. H. DICK has been elected to the board of Wailes Dove Bitumastic, Ltd.

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LORD MCGOWAN, chairman of Imperial Chemical Industries, Ltd., sailed from Capetown for England on February 24.

* * * *

MR. J. HOBBS, general manager of Stafford Allen and Sons, Ltd., has left estate valued at £5,596.

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MR. EDMUND JOSEPH BYRNE, chairman of the Rubber Chemical Co., Ltd., has left estate valued at £10,882 (net personalty £3,596).

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MR. ARTHUR PRATT, of Deganwy, Caernarvon, soap and chemical manufacturer, has left estate valued at £66,012 (net personalty £55,080).

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MR. HAROLD GUNDRY, director of the South Metropolitan Gas Company and the South Suburban Gas Company, has left estate valued at £69,824 (net personalty, £66,701).

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MR. ROGER DUNCALFE, vice-chairman of the Association of British Chemical Manufacturers and director of British Glues and Chemicals, Ltd., and MR. A. C. MACDIARMID, chairman of Stewarts and Lloyds, Ltd., have accepted the invitation to become members of the delegation of the Federation of British Industries for the forthcoming Anglo-German trade discussions in Berlin.

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MR. MATHEW ANDERSON, who has been appointed director of the Coal Utilisation Council, left vacant by the resignation of Mr. W. R. Gordon, takes up his duties at the beginning of this month. He has had wide experience of industrial publicity and development work, and as general manager and secretary of one of the pioneer industrial development bodies in England he helped to bring the business men and municipalities of Merseyside together for the establishment of new factories and for the promotion of trade in Merseyside area generally.

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MR. W. E. HALE, a director of the South Staffordshire Mond Gas Co., Ltd., and Melanoid, Ltd., makers of heat resisting paints, jointly with his brother Mr. T. L. Hale, has purchased an estate of nearly 1,500 acres at Oswestry, formerly belonging to Lord Harlech. Mr. W. E. Hale is managing director of Hale and Hale (Tipton), Ltd., who are large manufacturers of iron castings, some of which are used for chemical plant purposes. Mr. T. L. Hale is the technical director of the company.

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MR. DESMOND CANNON BROOKES, manager of the Aluminium Information Bureau, Bush House, since 1937, has left to take up a position with Aluminium Union, Ltd. The Bureau is conducted by the Northern Aluminium Co., Ltd., in whose sales department Mr. Cannon Brookes has held a number of executive positions during the past seven years. The new manager of the Bureau is Mr. E. D. Iliff, B.Sc. (Eng.), technical sales adviser to the Birmingham works of the Northern Aluminium Company, who will take up his duties at Bush House on March 6.

OBITUARY

MR. WILLIAM ROUSE, assistant manager at Rhodes Print Works, Middleton, near Manchester, died recently at the age of 62. He received his training at Glasgow Royal Technical College, and subsequently held appointments at Dalmonach Print Works, Ferryfield Print Works, South Arthurlie Print Works, and at Thornliebank Print Works, where he became manager in 1924. When these works closed in 1931 he was transferred to the Strines Printing Co. and in the same year went to Rhodes.

MR. STANLEY SIMS, an analytical chemist, who had been associated with the copper industry in the Hafod district of Swansea for thirty years and was originally with the Vivian Copper Co., died at Swansea on February 24 at the age of 53.

TO-DAY'S ANNIVERSARY

ANDREAS SIGISMUND MARGGRAF, born on March 4, 1709, was a pupil of Georg Ernst Stahl and carried out original investigations on phosphorus and microcosmic salt. Pioneer of analytical chemistry, he distinguished alumina from lime in 1754 and potash from soda in 1757 by chemical tests. He was also the first to show (1758) that sodium and potassium salts could be distinguished by their yellow and lilac flame colorations. Ten years later he described hydrofluoric acid and suggested the existence of the element fluorine, but it was not until 1886 that fluorine was first isolated by Moissan, who electrolysed a solution of potassium hydrogen fluoride in liquid hydrogen fluoride. Marggraf prepared sugar from beet in 1749.

The Protective Action of Zinc on Iron

Actual Contact of the Two Metals Shown to be Unnecessary

THE results of some experiments leading to a modified interpretation of the action of zinc in protective coatings on iron are described by Stuart (*Paint Manufacture*, 1939, 9, 49-51, 57). It is usually considered that the protective action of zinc on iron, e.g., in galvanised iron, is to be sought in the fact that zinc is cathodic to iron, so that when the coating is punctured, a short circuited cell is set up, in which the zinc dissolves instead of the iron. This theory no doubt is true in part, but by no means accounts for all the facts of observation.

Thus it is quite easy to show that actual contact of the two metals in the corroding solution is by no means necessary for the protective action of zinc to be exerted. A rod of zinc was immersed in water until it reached the constant negative potential of 1.035 volts. Then a rod of iron was immersed in the same solution, and its change in potential compared with that of a similar rod immersed in fresh water. The increase of potential with time was much smaller in the case of the first rod, and the amount of rusting on this rod was also much less. Some zinc dust was shaken up with water and then the metal filtered off. A piece of iron was immersed in this solution and its behaviour compared with that of a piece immersed in fresh water. The latter rusted after a few hours, the former not for several days. Even more striking was the effect of immersing a piece of polished iron in water, and placing over it a piece of zinc of somewhat smaller area, and separated from direct contact with it by some insulating beads. Rusting only occurred on those parts of the piece of iron not covered by the zinc.

These facts seem to suggest that the protective action of zinc is due to some reaction which occurs between it and the rusting solution; this may be either a deoxidation or a saturation of the solution with zinc ions, which would repress the ionisation of the iron. In any case the effect is proved, and indicates that a protective film containing zinc not in metallic contact with iron, would give good rust-proofing service, and would not be so sacrificial in zinc. Several exposure tests of iron painted with linseed oil red lead priming coats containing zinc have borne out this contention, the coats being scratched before exposure. The coats in all cases had a resistance of about a megohm, so they may be considered as non-conducting, and cathodic solution of the zinc is out of the question. In this connection mention is made of the "Duraspray" process in which a red lead priming coat is first applied to the iron surface, and then zinc dust sprayed on with dry compressed air.

General News——From Week to Week

AN AGREEMENT HAS BEEN SIGNED between a group of German firms and the Granitoid company of Sofia for the exploitation of lead and zinc ore in the Bulgarian Rhodope mountains.

RICHARD THOMAS AND CO., restarted eight more tinplate mills at Llanelly this week. The mills, which have been idle for two months, employ 200 men. In the past month 22 mills have been restarted, mainly on the strength of Canadian orders.

SIR PERCY ASHLEY, secretary of the Import Duties Advisory Committee, speaking at a luncheon of the British Plastics Federation, Ltd., last week, said that the output of the plastics trade in 1938 was 500,000 tons, compared with 50,000 in 1913.

SCIENTIFIC INSTRUMENTS AND LABORATORY FURNISHINGS said to be valued at over £1,000 were destroyed when fire broke out on Monday in the chemical storeroom of Thomson, Skinner and Hamilton, Ltd., scientific instrument and apparatus manufacturers, Glasgow.

WORKERS AT THE EXPLOSIVES FACTORY of I.C.I., Ltd., at Ardeer, will be the first to broadcast to Scottish radio listeners in a new series of "Trade Shows." The broadcast will take place during the second week in April. "Trade Shows" will depend on a different trade or industry for each performance.

THE SECOND ANNUAL WHIST DRIVE AND DANCE of Oxley Engineering Co., Ltd., was held on February 16, at the Capitol Ballroom, Meanwood, Leeds. The chairman of the company, Mr. H. H. Hollis, welcomed the guests, employees and friends, by a short speech at the commencement of the proceedings. There was an assembly of 170 people, and the whist drive prizes were kindly given by Mrs. H. Saville. At the conclusion of the prize-giving, the wife of the chairman presented Mrs. Saville with a bouquet on behalf of the firm.

A MODEL OF A COMPLETE VEGETABLE OIL REFINERY will be on exhibition at the Leipzig Fair to be held from March 5 to 13. It will include a benzine extraction plant; a refining plant for purifying the crude oil and for producing edible oils and fats; and an oil solidifying plant for the production of edible fats or technical greases. The whole installation is said to be very accessible throughout and easy to operate, requiring only a minimum of personnel. The preparation of the catalyst (nickel carbonate, nickel formate, etc), used in the solidification of oils will be shown and the exhibit will also comprise a plant for the production of hydrogen.

THE REPORT FOR 1937-38 of the Usines Réunies de Produits Azotés á Moscice á Chorzow (Poland) contains the following figures which illustrate the growth in their production of fertiliser products:—

	1933/34	1934/35	1935/36	1936/37	1937/38
Nitrogenous fertilisers ...	100%	101.5%	97.4%	132.4%	180.8%
Technical nitrogenous products ...	100%	107.3%	110.9%	158.4%	178f8%
"Supertomasyna" (30% P_2O_5) ...	100%	157%	172.3%	387.1%	397.1%

MR. G. H. SMITH, PH.D., chief chemist of Scottish Oils, Ltd., in a paper on the shale oil industry, which he read to members of the Royal Scottish Society of Arts at Edinburgh on February 27, pointed out that in retorting oil shale the products were: (1) oil, including light spirit from the gas; (2) ammonia from the nitrogen of the shale; and (3) spent shale. The first, including the spirit recovered from the permanent gas produced in retorting, was refined at a central refinery. The ammonia was combined with sulphuric acid, and sold as sulphate of ammonia, while bricks were made from spent shale by a process similar in some respects to the sand-lime process. Methods of refining shale oil depended entirely on which products were most desired. Being paraffinic in nature, Scotch shale oil was an excellent base for the production of light Diesel oil for high-speed Diesel engines, so that to-day attention was mainly concentrated on Diesel oil, together with motor spirit, wax and coke. The essential operations in refining to Diesel oil were: distillation to isolate the appropriate fractions of the crude oil, extraction of wax to lower the setting point of the oil, treatment with sulphuric acid and caustic soda to remove nitrogen, sulphur and oxygen compounds, and finally redistillation to get any oil of the exact distillation range necessary for light diesoleum.

THE NEW MARGARINE WORKS, of Cardonald Margarine Works, Ltd., of Glasgow, were officially opened and the producing unit started on February 22. The unit has been described as one of the most compact margarine-producing units in existence.

FOLLOWING THE DEATH ON FEBRUARY 10, of Mr. E. R. Bolton, F.I.C., M.I.Chem.E., the practice carried on by him at 6 Milner Street, London, S.W.3, will be continued at that address by the same staff whose senior chemist is Mr. K. A. Williams, B.Sc., F.I.C.

PEKIN SYNDICATE, LTD., have been given a monopoly by the National Resources Committee of the Government of China in respect of the export of wolfram from China, the principal world source of supply. China exported nearly 10,000 tons of wolfram out of a total world supply of 28,000 tons during 1937.

AN INCREASED AMOUNT OF FUNDAMENTAL RESEARCH is being carried out at the Derby laboratory of the L.M.S. railway, stated Lord Stamp, the chairman of the company, at a meeting held in London on February 24. Improved methods of testing paints have facilitated the development of new finishes and effects, and the laboratory is said to be making a very complete study of methods of preparing steel prior to painting. They have already developed a new inhibitive wash and primer, which is being tried extensively on large steel constructions such as bridges.

IT IS UNDERSTOOD THAT THE ENTIRE CHEMICAL AND DYES BUSINESS of the Havero Trading Co., Ltd., of India, has been transferred to the new company of Chemdyes, Ltd., with registered offices in Bombay and branches in all the principal cities in India. The company has been formed with a capital of Rs.2,00,00,000, of which Rs.80,00,000 is paid up. For the present, no public issue of shares is being made. The amount of capital subscribed indicates that substantial business is expected, and that Chemdyes, Ltd., may take an active share in Indian industrial development.

WIDE ATTENTION HAS LATELY BEEN DRAWN to the schemes put forward by the National Savings Committee for the encouragement of saving for holiday purposes. The schemes have been adopted by a large number of firms in many trades. One of the main reasons for the success of the schemes is the fact that they have been given commendation by many important Trade Federations. The following are amongst the organisations which have supported the schemes in this way: Engineering and Allied Employers' National Federation; Glass Manufacturers' Federation; Iron and Steel Trades Employers' Association. Similar action has been taken by certain leading Trades Unions.

AN EXHIBITION NOW ON VIEW AT THE ROYAL INSTITUTION OF SOUTH WALES, Swansea, entitled "Coal in Science and Industry," deals largely with the utilisation of coal in power plants, etc., but a comprehensive section illustrates the chemical uses of coal and coal extraction. One of these items describes, in word and picture, the process of hydrocarbon synthesis in which the production of oils from water gas takes place at atmospheric pressure by means of a catalyst consisting of cobalt oxide promoted with thorium oxide and supported on a base of kieselguhr. It is emphasised that uniformity of temperature distribution throughout the catalyst must be maintained within narrow limits, and this is achieved by circulating superheated water through tubes in the bed of the catalyst, the temperature being then controlled by regulation of the pressure in the boiler to which the tubes are connected. It is shown how the heavier oils are collected in a water-cooled condenser, and the lighter spirit is scrubbed out by means of active carbon. Specimens of the products are exhibited. Other features deal with the extraction of carbon from coke and anthracite for carbide manufacture, the manufacture of acetylene, its polymerisation to vinyl acetylene, from which oils, plastics and synthetic rubber are produced.

Books Received

The Elements of Fractional Distillation. By Clark Shove Robinson and Edwin Richard Gilliland. 3rd edition. London: McGraw-Hill Publishing Co., Ltd. Pp. 267. 18s.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

PRODUCTION OF RESINOUS CONDENSATION PRODUCTS.—Beck, Koller, and Co. (England), Ltd. (Hovey and Hodgins). 3551.

PROCESS FOR THE SEPARATION OF LAC INTO FRACTIONS.—R. Bhattacharya, and A. J. Gibson. 4142.

MANUFACTURE OF CELLULOSE DERIVATIVES.—British Celanese, Ltd. (United States, Feb. 2, '38.) 3509.

MANUFACTURE OF CONDENSATION PRODUCTS from quinones.—British Drug Houses, Ltd., and J. L. Sweeten. 4195.

PROCESS FOR MAKING OLEFINE OXIDES.—Carbide and Carbon Chemicals Corporation. (United States, March 15, '38.) 3935.

MANUFACTURE OF RESINOUS CONDENSATION PRODUCTS.—A. Carpmael (I. G. Farbenindustrie.) 3765.

MANUFACTURE OF AZODYESTUFFS.—A. Carpmael (I. G. Farbenindustrie.) 3908.

MANUFACTURE OF HYDROGEN PEROXIDE.—R. C. Cooper, P. Harrower, O. H. Walters, and Imperial Chemical Industries, Ltd. 3886.

MANUFACTURE OF SOAP.—Cussons, Sons and Co., Ltd., and B. Gutermann. 3808.

MANUFACTURE OF ORGANIC COMPOUNDS.—B. Gaspar. 3781, 3782.

MANUFACTURE OF BASIC CONDENSATION PRODUCTS.—J. R. Geigy, A.-G. (Switzerland, Nov. 4, '38.) 3884.

RUBBER COMPOSITION.—Henley's Telegraph Works Co., Ltd., H. A. Tunstall, and B. B. Evans. 3761.

MANUFACTURE OF CONDENSATION PRODUCTS.—R. M. Hughes (J. R. Geigy, A.-G.). 4031.

DYEING PELTS, ETC.—I. G. Farbenindustrie. (Germany, Feb. 18, '38.) 3631.

ODORIFEROUS SUBSTANCES.—I. G. Farbenindustrie. (Germany, Feb. 19, 38.) 3632.

MANUFACTURE OF RESIN-LIKE CONDENSATION PRODUCTS.—I. G. Farbenindustrie. (Germany, Feb. 19, '38.) 3633.

MANUFACTURE OF PARA-AMINOBENZALDEHYDES.—I. G. Farbenindustrie. (Germany, Feb. 21, '38.) 3634.

PRODUCTION OF PHENOLS from their aqueous solutions.—I. G. Farbenindustrie. (Germany, Feb. 5, '38.) 3766.

MANUFACTURE, ETC., OF NITROGLYCERINES which are difficult to freeze.—I. G. Farbenindustrie. (Germany, Feb. 10, '38.) 3992.

MANUFACTURE, ETC., OF NITRIC ACID ESTERS of monoacyl glycerines.—I. G. Farbenindustrie. (Germany, Feb. 10, '38.) 3993.

RECOVERY OF AMMONIA from solutions or gases which also contain weak gaseous acids.—G. W. Johnson (I. G. Farbenindustrie.) (Feb. 18, '38.) 4182, 4183.

PURIFICATION OF GASES.—G. W. Johnson (I. G. Farbenindustrie.) (Feb. 18, '38.) 4184.

Specifications Accepted with Date of Application

REMOVING WEAKLY ACID-REACTING ORGANIC COMPOUNDS from liquids chiefly consisting of liquid mixtures of hydrocarbons or hydrocarbon derivatives.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Sept. 9, 1936. 499,978.

MANUFACTURE OF DECOLOURISING AND FILTERING AGENTS.—R. W. Schmidt. Oct. 26, 1937. 499,992.

POLYVINYL RESIN COMPOSITIONS for sizing textiles.—Soc. Nobel Francaise. March 13, 1937. 499,995.

MANUFACTURE OF CONVERSION PRODUCTS OF DYESTUFFS.—Soc. of Chemical Industry in Basle. Dec. 16, 1936. 500,068.

MANUFACTURE OF MORDANT AZO-DYESTUFFS.—Durand and Huguenin, A.-G. Jan. 15, 1937. 500,075.

CERAMIC PRODUCTS and methods of manufacturing them.—Babcock and Wilcox Co. Feb. 27, 1937. 499,920.

DISTILLATION OF PITCH and like carbonaceous materials.—Rutgerswerke, A.-G., and L. Kahl. Jan. 12, 1938. 499,924.

PROCESS OF AND APPARATUS FOR THE PRODUCTION OF BARIUM SULPHIDE from barytes.—Metallges, A.-G. June 30, 1937. 499,925.

CONCRETE HARDENING COMPOSITIONS of the metal salt type.—Sonneborn Sons, Inc. Dec. 24, 1937. 500,086.

PRODUCTION OF UNSATURATED ALCOHOLS.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. April 3, 1937, 500,010.

PRODUCTION OF TITANIUM DIOXIDE PIGMENTS.—E. I. du Pont de Nemours and Co., and R. M. McKinney. April 4, 1938. 500,012.

TREATMENT OF CASEIN FIBRES.—Naamlooze Vennootschap Onderzoekingsinstituut Research. May 11, 1937. 500,013.

ALIMENTARY PRODUCTS and processes of making the same by hydrogenating oils.—W. U. Dykes (Ontario Research Foundation). April 25, 1938. 500,087.

POLYVINYL RESIN COMPOSITIONS.—British Thomson-Houston Co., Ltd. April 30, 1937. 499,931.

TREATMENT OF VEGETABLE MATERIALS.—Naamlooze Vennootschap Nederlandsch Research Centrale, and S. H. Bertram. May 2, 1938. 500,158.

TREATMENT OF RUBBER.—United States Rubber Products, Inc. May 18, 1937. 499,935.

LUBRICANTS.—H. W. Brownsdon, and Imperial Chemical Industries, Ltd. July 30, 1937. 500,166.

PREPARATION OF LUMINOUS ENAMELS.—Auerges, A.-G. July 30, 1937. 500,171.

MANUFACTURE OF CONDENSATION PRODUCTS of the diphenylamine series.—I. G. Farbenindustrie. July 27, 1937. 500,026.

PRODUCTION OF PERCHLORETHYLENE.—Consortium Fur Elektrochemische Industrie Ges. Aug. 10, 1937. 500,176.

Chemical and Allied Stocks and Shares

THE industrial and allied sections of the Stock Exchange have been more active this week and the upward trend in values has made further progress. More encouraging views as to dividend prospects are now current in the market, and it is being pointed out that in the majority of cases leading industrial securities still offer apparently generous yields.

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Among shares of chemical and kindred companies British Oxygen were in request, and as compared with a week ago have risen further from 73s. 9d. to 75s. at the time of writing. Distillers were favoured and have strengthened from 92s. 9d. to 94s. 6d. on hopes that the distribution for the year may be kept at 22½ per cent. Associated Cement ordinary units were strong and have improved further from 74s. 1½d. to 75s., awaiting the impending dividend announcement. Lever and Unilever were 1s. better at 35s. 3d. and International Nickel improved, in common with most shares with a market on both sides of the Atlantic. The annual report of the last-named company is expected to be issued this month.

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There was again considerable activity in Imperial Chemical ordinary units around 32s., awaiting the forthcoming dividend announcement, market views in connection with which have been mentioned in these notes. Pinchin Johnson and Indestructible Paint were active among other shares of companies whose dividends fall to be declared shortly. International Paint were firm at 77s. 3d. under the influence of the preliminary figures.

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Imperial Smelting attracted rather less attention, but at the time of writing the price had held last week's rally to 12s. 3d. Wall Paper deferred units have moved up further from 32s. 6d. to 33s. 9d. British Oil and Cake Mills preferred ordinary remained steady at 41s. 6d. pending publication of the results. British Plaster Board made the slightly lower price of 26s. 3d. British Celanese and other rayon shares remained active under the influence of the recent increase in rayon yarn prices. Courtaulds were good at 29s. 3d., a rise of 1s. on balance, there being hopes that at the forthcoming meeting the view may be expressed that better results should be obtained this year. Calico Printers and most cotton textile shares, however, showed little activity and were little changed in price.

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Dorman Long were firm among iron and steel securities, sentiment being influenced by the news that the company is to restart further furnaces at two of its works. Colvilles were moderately better, awaiting the dividend announcement, while Baldwins were steady. The Sheffield price for Newton Chambers' ordinary shares remained at 40s. Borax Consolidated were firmer at the slightly higher level of 22s. 3d., while attention continued to be given to Birmid Industries, and Murex moved up to 79s. 4½d. Fison Packard and Prentice were again steady at 38s. 9d.

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Boots Pure Drug were maintained at 40s. 7½d. and Sangers were again 21s. Timothy Whites and Taylors were better at 25s. B. Laporte were more active around 80s. Both United Glass Bottle and Canning Town Glass shares were steady, awaiting declaration of the dividends, expected later in the month.

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Leading oil shares were in better request and have moved to higher levels this week. "Shell" were influenced by market anticipations that, although a reduction in profits seems likely, it may be possible to keep the dividend on a 20 per cent., tax free basis.

Weekly Prices of British Chemical Products

A STEADY trade is reported from most sections of the general chemical market with rather more activity being displayed in export business. Buyers are calling up their contract commitments with promptness and quite substantial quantities are going forward for consumption. So far as the price position is concerned quotations remain steady at recent levels with the undertone perhaps a little firmer. Some expansion in the volume of trade in coal tar products has been in evidence this week and conditions throughout the market show a decided improvement. A good demand has been put through for toluol and xylol and both items are a little firmer in quotation. Values in other directions are steady with a firm undertone.

MANCHESTER.—Although for the most part fresh business in chemical products on the Manchester market during the past week has been on a moderate scale most traders report a slight change for the better, and this remark also applies to the demand for supplies against old contracts. Prices generally are on a steady basis. In the case of the tar products the demand for pitch, creosote oil and one or two of the other heavy materials remains rather slow and the tendency of prices is still occasionally easy. Most of the light distillates, however, are on a steady basis and a fair amount of business is passing.

Price Changes

Rises: Xylol, commercial and pure.

Falls: Copper Sulphate (Manchester); Naphthalene, purified crystals; Pitch (Manchester).

GLASGOW.—There has been a slight improvement in the demand for general chemicals, both for home trade and export. Prices continue very steady at about previous figures, with no important changes to report.

General Chemicals

ACETONE.—£39 to £43 per ton, according to quantity.

ACETIC ACID.—Tech, 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 5s. 0d. per ton d/d Lancs. GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey, £17 10s. per ton, d/d U.K. Fine white, 98%, £16 per ton, d/d U.K.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8¼d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £16 per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £12 per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contract. SCOTLAND: £9 5s. per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 4½d. per lb. d/d station in single 70-lb. cylinders.

CHROMETAN.—Crystals, 2½d. per lb.; liquor, £13 per ton d/d station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—9d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—11¼d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0¼d. per lb. MANCHESTER: 1s. 0¼d. SCOTLAND: B.P. crystals, 1s. 0¼d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£18 5s. per ton, less 2% in casks. MANCHESTER: £18 10s. per ton f.o.b. SCOTLAND: £19 10s. per ton, less 5%, Liverpool in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £3 17s. 6d. to £4 17s. 6d. per cwt. according to quantity; in drums, £3 10s. 0d. to £4 2s. 6d.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 9d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £29 10s.; brown, £1 per ton less. MANCHESTER: White, £31; brown, £30.

LEAD, NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£30 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. SCOTLAND: £30 per ton, less 2¼% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £30 per ton, less 2½ %, carriage paid for 2-ton lots.

MAGNESITE.—Calcined, in bags, ex works, about £8 per ton. SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—Solid (ex wharf) £5 10s. per ton. SCOTLAND: £7 5s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 6s. 5d. per lb.; powder B.P., 6s. 7d.; bichloride B.P. (corros. sub.), 5s. 8d.; powder B.P. 5s. 4d.; chloride B.P. (calomel), 6s. 5d.; red oxide cryst. (red precip.), 7s. 6d.; levig., 7s.; yellow oxide B.P. 6s. 10d.; persulphate white B.P.C., 6s. 7d.; sulphide black (hyd. sulph. cum. sulph. 50%), 6s. 6d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3½d. per lb.

POTASH, CAUSTIC.—Solid, £33 5s. to £38 per ton according to quantity, ex store; broken, £40 per ton. MANCHESTER: £38.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4½d. per lb. MANCHESTER: £37 per ton.

POTASSIUM DICHROMATE.—5½d. per lb. carriage paid. SCOTLAND: 5¼d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 6s. 3d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9½d. to 10½d. per lb. SCOTLAND: B.P. Crystals, 10½d. MANCHESTER: B.P. 9½d. to 11½d.

POTASSIUM PRUSSIATE.—5½d. to 6d. per lb. SCOTLAND: 6¾d. net, in casks, ex store. MANCHESTER: Yellow, 6d. to 6¼d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6¾d. per lb. net, ex store

SALAMMONIAC.—Firsts lump, spot, £42 17s. 6d. per ton, d/d address in barrels. Dog-tooth crystals, £35 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 8s. 6d. per ton.

SODA ASH.—Light, 98/100%, £5 17s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, 13s. 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£19-£20 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags in 1-ton lots. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. MANCHESTER: £10 15s.

SODIUM BISULPHITE POWDER.—60/62%, £12 10s. to £14 per ton d/d in 2-ton lots for home trade.

SODIUM CARBONATE MONOHYDRATE.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

SODIUM CHLORATE.—£27 10s. to £32 per ton. GLASGOW: £1 11s. per cwt., minimum 3 cwt. lots.

SODIUM DICHROMATE.—Crystals cake and powder 4½d. per lb. net d/d U.K. with rebates for contracts.

SODIUM CHROMATE.—4½d. per lb. d/d U.K.

4d. per lb. GLASGOW: 4½d. net, carriage paid.

SODIUM HYPOSULPHITE.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.

SODIUM METASILICATE.—£14 5s. per ton, d/d U.K. in cwt. bags.

SODIUM NITRATE.—Refined, £8 per ton for 6-ton lots d/d. GLASGOW: £1 12s. 0d. per cwt. in 1-cwt. kegs, net, ex store.

SODIUM NITRITE.—£18 5s. per ton for ton lots.

SODIUM PERBORATE.—10%, £4 per cwt. d/d in 1-cwt. drums.

SODIUM PHOSPHATE.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £16 10s. per ton delivered per ton lots.

SODIUM PRUSSIATE.—4d. per lb. for ton lots. GLASGOW: 4d. MANCHESTER: 4½d. to 5d.

SODIUM SILICATE.—£8 2s. 6d. per ton.

SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 10s.

SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.

SODIUM SULPHITE.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

TARTARIC ACID.—1s. 1½d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1½d. per lb. GLASGOW: 1s. 1½d. per lb., 5%, ex store.

ZINC SULPHATE.—Tech., £11 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARYTES.—£6 to £6 10s. per ton, according to quality.

CADMIUM SULPHIDE.—3s. 0d. to 3s. 3d. per lb.

CARBON BLACK.—3⅞d. to 4 1/16d. per lb., ex store.

CARBON DISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.

CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.

CHROMIUM OXIDE.—Green, 10½d. to 11½d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

INDIA-RUBBER SUBSTITUTES.—White, 4½d. to 5d. per lb.; dark 3⅜d. to 4⅜d. per lb.

LAMP BLACK.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.

LEAD HYPOSULPHITE.—9d. per lb.

LITHOPONE.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.

SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.

VERMILION.—Pale, or deep, 5s. per lb., 1-cwt. lots.

ZINC SULPHIDE.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1939; November, £7 8s.; December, £7 9s. 6d.; January, 1939; £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.

CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1939; November, £7 12s. 6d.; December, £7 13s. 9d.; January, 1939, £7 15s.; February, £7 16s. 3d.; March, £7 17s. 6d.; April/June, £7 18s. 9d.

NITRO CHALK.—£7 10s. 6d. per ton up to June 30, 1939.

SODIUM NITRATE.—£8 per ton for delivery up to June 30, 1939.

CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4½d. to 1s. 5d., pure 1s. 8½d. to 1s. 9d. GLASGOW: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d. MANCHESTER: Pure, 1s. 8d. to 1s. 8½d. per gal.; crude, 11½d. per gal.

CARBOLIC ACID.—Crystals, 6⅝d. to 7⅛d. per lb., small quantities would be dearer; Crude, 60's, 1s. 7½d. to 1s. 10d.; dehydrated, 2s. 6d. per gal., according to specification; Pale, 99/100%, per lb. f.o.b. in drums; crude, 2s. 1d. per gal.

CREOSOTE.—Home trade, 3½d. to 4d. per gal., f.o.r., makers' works; exports 6d. to 6½d. per gal., according to grade. MANCHESTER: 3d. to 4½d. GLASGOW: B.S.I. Specification, 6d. to 6½d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr. oils, 5¾d. to 6¼d.

CRESYLIC ACID.—97/99%, 1s. 5d. to 1s. 8d.; 99/100%, 1s. 9d. to 2s. 6d. per gal., according to specifications; Pale, 99/100%, 1s. 7d. to 1s. 9d.; Dark, 95%, 1s. 3d. to 1s. 4d. per gal. GLASGOW: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification, 3s. 9d. to 4s. MANCHESTER: Pale, 99/100%, 1s. 9d. to 1s. 10d.

NAPHTHA.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1½d. to 1s. 3d. per gal., naked at works, according to quantity. MANCHESTER: 90/160%, 1s. 5d. to 1s. 7d. per gal. GLASGOW: Crude, 6½d. to 7¼d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £4 10s. to £5 10s. per ton; purified crystals, £9 10s. per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £4 10s. per ton. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free). MANCHESTER: Refined, £11 10s. to £12 10s. per ton f.o.b.

PITCH.—Medium, soft, 30s. per ton, f.o.b. MANCHESTER: 27s. 6d. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.

PYRIDINE.—90/140%, 12s. to 13s. 6d. per gal.; 90/160%, 10s. to 11s. per gal.; 90/180%, 3s. to 4s. per gal. f.o.b. GLASGOW: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. MANCHESTER: 11s. to 13s. 6d. per gallon.

TOLUOL.—90%, 1s. 11d. to 2s. per gal; pure 2s. 3d. to 2s. 4d. GLASGOW: 90% 120, 1s. 10d. to 2s. 1d. per gal. MANCHESTER: Pure, 2s. 3d. per gallon, naked.

XYLOL.—Commercial, 1s. 11½d. to 2s. 0½d. per gal.; pure, 2s. 3½d. to 2s. 4d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £6 15s. to £9 5s. per ton; grey, £8 to £8 5s. MANCHESTER: Brown, £8 10s.; grey, £10.

METHYL ACETONE.—40.50%, £32 to £35 per ton.

WOOD CREOSOTE.—Unrefined, 6d. to 8d. per gal., according to boiling range.

WOOD NAPHTHA, MISCIBLE.—2s. 8d. to 3s. per gal.; solvent, 3s. to 3s. 5d. per gal.

WOOD TAR.—£3 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZIDINE, HCl.—2s. 7½d. per lb., 100% as base, in casks.

BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 11½d. per lb. d/d buyer's works.

m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.

o-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.

p-CRESOL, 34-5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.

DICHLORANILINE.—2s. 1½d. to 2s. 5½d. per lb.

DIMETHYLANILINE.—Spot, 1s. 7½d. per lb., package extra.

DINITROBENZENE.—7½d. per lb.

DINITROCHLORBENZENE, SOLID.—£79 5s. per ton.

DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 11d.

DIPHENYLAMINE.—Spot, 2s. 2d. per lb., d/d buyer's works.

GAMMA ACID, Spot, 4s. 4½d. per lb. 100% d/d buyer's works.

H ACID.—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.

NAPHTHIONIC ACID.—1s. 10d. per lb.

β-NAPHTHOL.—£97 per ton; flake, £94 8s. per ton.

α-NAPHTHYLAMINE.—Lumps, 1s. 1d. per lb.

β-NAPHTHYLAMINE.—Spot, 3s. per lb.; d/d buyer's works.

NEVILLE AND WINTHER'S ACID.—Spot, 3s. 3½d. per lb. 100%.

o-NITRANILINE.—4s. 3½d. per lb.

m-NITRANILINE.—Spot, 2s. 10d. per lb. d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 10d. to 1s. 11d. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.

NITRONAPHTHALENE.—9½d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.

SULPHANILIC ACID.—Spot, 8¾d. per lb. 100%, d/d buyer's works.

o-TOLUIDINE.—10½d. per lb., in 8/10 cwt. drums, drums extra.

p-TOLUIDINE.—1s. 10½d. per lb., in casks.

m-XYLIDINE ACETATE.—4s. 3d. per lb., 100%.

Forthcoming Events

London.

March 6.—Society of Chemical Industry. Joint Meeting with the Food Group. Burlington House, Piccadilly, W.1. 8 p.m. W. Godden, "'Trace' Elements in Human and Animal Nutrition."

March 7 and 14.—Royal Institution, 21 Albemarle Street, W.1. 5.15 p.m. W. L. Bragg, "The Chemistry of the Solid State."

March 7, 8 and 9.—University of London. Wellcome Research Institution, 183 Euston Road, N.W.1. 5.30 p.m. Professor Dr. W. Schulemann, "Chemotherapy."

March 8 and 9.—Institute of Metals. Institution of Mechanical Engineers, Storey's Gate, S.W.1. 10 a.m. (8th) Annual Dinner. 7 p.m. Grosvenor House, Park Lane, W.1.

March 9.—Sir John Cass Technical Institute. Jewry Street, Aldgate, E.C.3. 6.30 p.m. S. Judd Lewis, "Spectroscopic Analysis."

Oil and Colour Chemists' Association. K. Mackenzie-Richards, "Some Aspects of Fading of Coloured Pigments."

March 14.—Institution of Chemical Engineers. Burlington House, Piccadilly, W.1. 6 p.m. R. L. Quertier, "Problems of Compressors and Compressed Gases in Industry."

British Association of Chemists. Conway Hall, Red Lion Square, W.C.1. 8 p.m. Professor J. B. S. Haldane, "Heredity, Chemistry and Politics."

Birmingham.

March 7.—Electrodepositors' Technical Society. James Watt Memorial Institute, Great Charles Street. 3 p.m. A. W. Wallbank, "Electrodeposition of Various Metals on Zinc Alloy Die-castings." 5.30 p.m. E. G. Savage, "The Treatment of Magnesium Alloys in Hot Chromate Baths," and R. Spears, "Electrodeposits other than for Decorative and Corrosion Protection."

March 14.—Institute of the Plastics Industry. James Watt Memorial Institute, Great Charles Street. 8 p.m. A. R. Dunton, "Plastics in the Electrical Industry."

Leeds.

March 6.—Institute of Chemistry. Professor F. M. Rowe, "Advances in the Chemistry of Dyestuffs."

Liverpool.

March 9.—Institute of Chemistry. Reeces' Restaurant, Parker Street. 7.30 p.m. Dr. H. E. Cox, "Some Aspects of Chemical Dermatitis."

Manchester.

March 9.—Institute of Petroleum. Engineers' Club, Albert Square. 7.15 p.m. Annual General Meeting.

March 10.—Oil and Colour Chemists' Association. Reynolds Hall, College of Technology, Whitworth Street. 7 p.m. Dr. A. V. Blom, "Swelling and Permeability of Paint Films."

March 13.—Institute of the Plastics Industry. Engineers' Club, Albert Square. 7.30 p.m. Prize papers.

Newcastle.

March 8.—Society of Chemical Industry. Professor H. L. Riley, "Chemistry of Solid Carbon."

Scotland.

March 10.—Oil and Colour Chemists' Association. Dr. Otto Jordan, "Polymerisation Products with Particular Reference to Styrol Combination."

Sheffield.

March 10.—Institute of Metals. The University, St. George's Square. 7.30 p.m. L. E. Price and G. J. Thomas, "The Tarnishing of Silver and Its Prevention."

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Uruguay.—H.M. Consul at Montevideo reports that the Uruguayan State Electricity Supply and Telephones Administration is calling for tenders, to be presented in Montevideo by April 24, 1939, for the supply of 240,000 kilogs of lubricating oils. (Ref. T.Y. 18946/39.)

France.—An agent established at Lyons wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of fruit essences, pharmaceutical products for Southern France. (Ref. No. 179.)

British Guiana, Trinidad, Barbados, Windward, Leeward and Virgin Islands, Bermuda, Nassau, Jamaica, United States Virgin Islands, Dutch West Indies, Dutch Guiana, French West Indies.—An agent established at St. Croix, U.S. Virgin Islands, wishes to obtain the representation of United Kingdom manufacturers of soap for the above territory. (Ref. No. 142.)

Egypt.—A firm in Cairo wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of pharmaceuticals, perfumery, etc. (Ref. No. 159.)

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Satisfactions

B. H. SAUNDERS AND CO., LTD., London, E., chemical manufacturers. (M.S., 4/3/39.) Satisfaction February 17, of debenture registered October 1, 1935.

BAIRD AND TATLOCK (LONDON), LTD., London, E.C., laboratory furnishers. (M.S., 4/3/39.) Satisfaction February 17, of debentures registered May 24, 1932, to extent of £2,500.

JOHNSON AND SONS, MANUFACTURING CHEMISTS, LTD., London, N.W. (M.S., 4/3/39.) Satisfaction February 21, of debentures registered October 30, 1936.

RICHARD THOMAS AND CO., LTD., London, W.C., steel tinplate manufacturers. (M.S., 4/3/39.) Satisfaction February 16, of debenture stock registered August 6, 1938, to extent of £110,000.

THOMAS FELL AND CO., LTD., London, N.W., perfume and soap manufacturers, etc. (M.S., 4/3/39.) Satisfaction February 21, £250, registered June 16, 1937.

Company Winding-up Voluntarily

PATENT BORAX CO., LTD., February 21 (members). (C.W.U.V., 4/3/39.) J. J. Armstrong, 196 Ledsam Street, Birmingham, and another have been appointed liquidators.

Company News

Viscose Development Co., Ltd., have declared a dividend of 7 per cent., less tax, (6 per cent.).

Staveley Coal and Iron Co., Ltd., have announced an interim dividend of 2½ per cent., free of tax.

Brown, Bayley's Steel Works, Ltd., have declared an interim dividend of 5 per cent., tax free (the same).

Harringtons and Goodlass Wall, paint manufacturers, have declared a dividend of 10 per cent., plus a 2½ per cent. bonus, tax free (same).

Domestos, Ltd., chemical manufacturers and merchants, have increased their nominal capital by the addition of £2,000 beyond the registered capital of £5,000.

British Xylonite Co., Ltd., have declared a first and final dividend of 5 per cent., less tax (against a total of 10 per cent.). The profit for the year to December 31 was £30,836 (£48,633).

Berry Wiggins and Co., Ltd., oil refiners, have declared a dividend of 16.6 per cent. on "B" ordinary shares (the same), plus an additional one-half per cent. on "A" ordinary shares (the same).

The International Paint and Composition Co., Ltd., have declared a final dividend of 16 per cent. on the ordinary shares making 20 per cent. for the year 1938 (the same). Profits for the year were £161,099 (£158,295).

New Companies Registered

Walmat, Ltd. 348,634.—Private company. Capital £300 in 300 shares of £1 each. To acquire the business of a manufacturing chemist carried on by A. W. Matthews at Brockley, Kent. Directors: John Henry Walker, 48 Lee Road, Blackheath, S.E.3.

British Artificial Resin Company, Ltd. 348,384.—Private company. Capital £100 in £1 shares. To carry on the business of manufacturers of and dealers in chemicals, resins and all articles analogous thereto, both natural and synthetic, and all kinds of plastic or mouldable substances, etc. Subscribers: Evelyn Smith, 10 Norfolk Street, W.C.2; Doris E. Nixon.

J. E. Clapham (Watford), Ltd. 348,442.—Private company. Capital £500 in 500 shares of £1 each. To carry on the business of manufacturers of and dealers in photogravure, aniline, lithographic and letter press printing inks and requisites, dry and liquid colours, dyestuffs, paints, distempers, sizes, varnishes, etc. Subscribers: Joseph E. Clapham, Morar Cottage, Ridge Lane, Watford; Albert H. Lincs. Registered office: Cherry Tree Road, Watford.

Jackson and Chambers (Chemists), Ltd. 348,492.—Private company. Capital £500 in 500 shares of £1 each. To carry on the business of chemists, druggists, drysalters, oil and colour men, manufacturers of and dealers in pharmaceutical, medical, chemical, industrial and other preparations and articles, etc. Directors: Mrs. Marjorie D. B. Jackson, 13 Pages Lane, Great Barr, Staffs.; William B. Chambers. Registered office: 8 Queslett Road, Great Barr, Birmingham.

R. Hostombe, Ltd. 348,068.—Private company. Capital £20,000 in 20,000 shares of £1 each. To acquire the business of a merchant carried on by E. R. Hostombe at 2 Regent Street, Sheffield, as "R. Hostombe," and to carry on the business of manufacturers of and dealers in metals (including precious metals), minerals, ores, alloys, residues, and chemicals, chemical, industrial and other preparations, fertilisers, etc. Subscribers: Eric R. Hostombe, 19 Endcliffe Grove Avenue, Sheffield; Mrs. Beatrice M. Hostombe.